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BRIEFLY TOLD.

OBITUARY NOTE, COL. WILLIAM ELIOT BARROWS.—Last week, just before going to press, we received the news of the death of Colonel William Eliot Barrows, President of the Welsbach Company, and to that then necessarily scant mention we add these facts connected with his history. His death occurred at his home in Haverford, Pa., July 30th, and it was the result of a severe attack of Bright's disease, the first symptoms of which were developed early last winter. Colonel Barrows was born in Hudson, O., July 14, 1842, where his first tuition was gained, and his studies were subsequently completed in Phillips Academy, Andover, Mass. At the outbreak of the War of the Rebellion he entered the Federal service, and in 1865 retired therefrom with the title of Brevet Major. His first commercial experience was gained in the Lowell (Mass.) Machine Company, from whence he entered the service of the Ivanhoe Paper Company, Paterson, N. J. His next connection was with the firm of F. A. Leigh & Co., of Boston, who were prominently engaged in the purchase and sale of machinery for working cotton fibers into cloths of one sort or another. In 1875 he became identified with the Willimantic (Conn.) Linen Company, and it was in its service, perhaps, that his best work was done. On the death of the Willimantic Company's President (whose assistant he had been), the Company named him to the Presidential post. In the management of that great corporation he effected many substantial reforms, not the least of which were those tending to ameliorate the condition of the mill hands. In connection with his efforts there and elsewhere a later reward for him came in the shape of the honorary degree of Master of Arts, conferred by the University of Yale. Change of interests in the Willimantic Company eventually caused him to accept the Presidency and Managership of the Illinois works of the Pullman Car Company. Later on he accepted the post of United States Commissioner to the West Coast of South America for the benefit of the New Orleans Industrial Exhibition of some years ago. That mission having been successfully completed, he became Manager of the Hinckley Locomotive Works, Boston, and resigned that place to accept the position of Manager of the Welsbach Light Company. At that time the Company was just beginning to emerge from the difficulties that had been buffeting it, and under his decisive direction the small beginnings at Gloucester, N. J., which in short time grew to huge proportions, resulted in the development, in the United States, of the Welsbach burner as it is here to-day. When the Welsbach Light Company and the Welsbach Commercial Company, the latter being really the commercial agent for the former, were consolidated under the title of the Welsbach Company, Colonel Barrows was chosen President, and in its service death found him. He was an Associate Member of the American Gas Light Association, his membership therein dating from the meeting of 1889. The funeral services were held on the 2d inst., and, in accordance with his expressed desire, his remains were cremated. Deceased was a man of marked personality, but despite his assertiveness and his positive ideas and practice regarding discipline, we think no one will venture to contradict our here expressed thought that his blind justice was more than tempered by his open-eyed mercy. He was a remarkable man from two notable standpoints, rarely found in one human combination—he had wonderful mechanical talent

and surpassing commercial traits. At home he was the gentlest king that ever ruled a domestic kingdom, and none will more sincerely or longer mourn him than those who were bound to him by the closest ties. He is survived by Mrs. Barrows and their three sturdy sons. For material aid in compiling this obituary note we are indebted to Mr. Wm. Wallace Goodwin, of Philadelphia.

NOTES.—The Colusa (Cal.) Gas and Electric Company, which is beyond doubt a further development of Mr. John Martin's commercial genius, has been incorporated by Messrs. John Martin, Fred. H. Pierson, H. M. Roeding, H. R. Noack and Wm. R. Pierson. It is capitalized in $100,000.——"Governor" Hayward, the white-crowned head of the Connelly Iron Sponge & Governor Company, of this city, seems to have been quite successful this year in placing those useful governing instruments of his. In a chat with him last week he mentioned that the following companies had been thus equipped in the governing line—the balance governors named are placed where holders of three or more lifts are built, and are used to guarantee a uniform pressure, or that carried by the lowest lift: Lowell (Mass.) Gas Company, one 24--inch automatic and one 24-inch balance; Independent Gas Company, San Francisco, Cal., one 24-inch automatic and one 24-inch balance; Lawrence (Mass.) Gas Company, one 20-inch automatic and one 20-inch balance; Flatbush (N. Y.) Gas Company, one 20-inch automatic and one 20-inch balance; Milwaukee (Wis.) Gas Company, one 20-inch automatic and two 20-inch balance; Pittsfield (Mass.) Coal Gas Company, one 12-inch automatic and one 12-inch balance; Tarrytown (N. Y.) Gas Company, one 12-inch automatic and one 12-inch balance. The remaining ones on the list are all of the automatic type: South Bend (Ind.) Fuel and Gas Company, one 16-inch; Scranton (Pa.) Gas and Meter Company, one 16-inch; New York and Richmond Gas Company, Clifton, S. I., one 16-inch; Meriden (Conn.) Gas Light Company, one 16-inch; Philadelphia and Suburban Gas Company, Darby, Pa., one 12-inch; De Kalb (Ills.) County Gas Company, one 10-inch; Wausau (Wis.) Gas Light and Coke Company, one 8-inch; Burlington (N. J,) Gas Light Company, one 6-inch; Manitowoc (Wis.) Gas Company, one 6-inch; Town of Hempstead Gas and Electric Light Company, Far Rockaway, N. Y., one 10-inch; Beloit (Wis.) Gas Light and Coke Company, one 8-inch; Ridgewood (N. J.) Gas Company, one 8-inch; Citizens Gas Company, Quincy, Mass., one 6-inch; Steelton (Pa.) Gas Company, one 6-inch; Dover, Port Oram and Rockaway Gas Company, Dover, N. J., one 10-inch.——At the annual meeting of the Equitable Illuminating Gas Light Company, Phila., Pa., the officers chosen were: Directors, James Ball, F. H. McMorris, J. A. Pearson, J. W. Morris and David H. Lane; President, James Ball; Vice-President, David H. Lane; Treasurer, W. A. McEwen; Secretary, F. H. McMorris; Assistant Treasurer, F. S. Whittaker.——Under the agreement with the authorities of Merchantville, N. J., the South Jersey Gas, Electric and Traction Company will supply gas in that borough at the rate of $1.25 per 1,000 cubic feet.——The Cincinnati Gas and Electric Company has arranged for the construction of a handsome, modern office building on the site at the corner of 4th and Plum streets. It will be one of the finest office buildings in Cincinnati, and will be occupied exclusively by the Company.——Mr. J. S. Brown, of Lexington, Ky., has been appointed Superintendent of the Clinton (Mass.) Gas Light Company.——The proprietors of the Pittsfield (Mass.) Coal Gas Company have decided to increase the capital stock to $125,000.——The auction sale of the Napanee (Can.) gas works has been postponed to the 15th inst.——The report of the Detroit (Mich.) Gas Company, for the 6 months ended June 30, 1901, shows an output of 182,956,200 cubic feet. The output for the corresponding half of 1900 was 154,900,000 cubic feet.——At the annual meeting of the Fall River (Mass.) Gas Works Company a semi-annual dividend of 4 per cent. was declared. The officers elected were: Directors, Jno. S. Brayton, H. H. Eddy, Geo. P. Brown, S. T. Bodine, Randall Morgan, H. Lewis and D. Patton; Clerk and Manager, George P. Brown; Treasurer, Lewis Lillie.——The Canadian Niagara Power Company have appointed Cecil B. Smith, late assistant city engineer of Toronto, Ont., to be resident engineer of that Company, and he will have charge of the new power development on the Canadian side at the falls. A. Monro Crier of Toronto has been appointed resident solicitor of the Company, and he will be located on the Canadian side at Niagara. The shaft that is being sunk preparatory to the tunnel construction has reached a depth of nearly 100 feet. This part of the contract is being done by A. C. Douglass, of Niagara Falls, N. Y. Within a few days it is the announced intention of the Canadian Niagara Power Company to invite proposals for the construction of the first section of their proposed wheel pit.——Mr. T. A. Bates has been appointed Superintendent of the Traverse City (Mich.) Gas Company.

Report on the International Congress of the Gas Industry (Paris, France, September, 1900), to the Pacific Coast Gas Association.

By MR. J. B. GRIMWOOD, San Francisco, Cal.

One year ago you conferred upon me a great honor, in appointing me your official representative at the International Congress of the Gas Industry, which convened in Paris during the Exposition of 1900. A resolution was passed at that time to the effect that my report be made the subject of a special paper at the next meeting, and the time is now at hand to present that report. In assuming the duties then entrusted to me, I fear that I failed signally to appreciate the magnitude of the undertaking. To report fully and exhaustively upon the Paris convention, where were brought together, from the 4 quarters of the globe, the greatest gas engineers of the present day, would be an impossibility within the few brief moments allotted to me at this meeting.

Before me lies a volume of considerably more than 1,000 pages, to say nothing of the vast number of tabulated statements, charts and maps of every conceivable description. It is the story of the Paris convention. I believe the Pacific Coast Gas Association should have a complete record of the Proceedings of this convention, and I am pleased to present to the Association a full report as printed in Paris.

I will ask your indulgence a little while and endeavor to portray to you the conditions under which the gas men of the world met in convention, and what was done for their comfort and entertainment by the Société Technique de l'Industrie du Gaz en France and the Compagnie Parisienne du Gaz, as hosts of the occasion.

I arrived in Paris Friday, the 31st of August, and presented myself at the office of the Secretary, 65 Rue de Provence, late Saturday afternoon, September 1st, where I was handed a quantity of papers relating to the affairs of the Congress, and amongst these a pass which admitted me to the exposition grounds at any time during the period covered by the meeting of the Congress at which I was in attendance. There was also a small badge with a coupon to be detached by the doorkeeper and presented, as a record of attendance, the first time the bearer attended the deliberations. Members were also requested to register their names and Paris addresses at the Palais des Congrès, in order that stenographic reports of each day's meeting could be promptly forwarded them. A large sheet was provided for this purpose divided into columns for the various nations represented. Thus a very complete record of the actual attendance was obtained. Everything, to the minutest detail, was attended to and nothing left undone which could in any way facilitate the workings of the Congress or add to the convenience of the members.

On Saturday evening the Société Technique de l'Industrie du Gaz held its 27th annual banquet, to which members of the Congress were invited. The banquet was held in the magnificent Hotel Continental, in the very heart of the great city of Paris, and directly opposite the beautiful and historic Garden of the Tuileries. It was well attended, and the measure of its success was only limited by the ability of the finest of French *chefs* and the most hospitable of French hosts. I shall not soon forget the honorable privilege I then enjoyed in sitting down to so goodly a feast, so magnificently served, and in such company. It was on this occasion that I first had the pleasure of meeting with M. Theo. Vautier, who not only presided at the banquet, but, as President of the Congress International de l'Industrie du Gaz, conducted its affairs in so masterly a manner that I cannot but believe much of its success was due to his personal efforts.

The banquet afforded an opportunity for members to become acquainted, and later in the evening I had the extreme pleasure of meeting several representatives from my own country, as well as some English engineers whose acquaintance I had made at their own works in England during the previous month.

Apparently not satisfied with the social courtesies which had been extended to members at the banquet of Saturday night, the Société Technique de l'Industrie du Gaz en France tendered the foreign members of the International Congress and their families a soirée on the following Monday evening, at which we were entertained in the same royal manner.

On Monday morning the real work of the convention began. A large, fine, white wooden building, known as the Place des Congrés, had been erected in the exposition grounds, on the right bank of the Seine, close to one of the entrances at the Place de l'Alma, and in this building all of the numerous congresses, representing the world's intellectual and industrial energies, were held. A commodious hall was reserved for the gas men, and here the Congress was called to order, at 9:30 A.M., Tuesday, September 3d, 1900, by President Vautier, in these words:

Gentlemen—In the name of the Commission of Organization of the Congress, I declare that the First International Congress of the Gas Industry is hereby opened.

Monsieur Vautier was assisted in his labors by 3 Vice-Presidents and 11 Honorary Presidents from various countries, two of whom were our fellow-countrymen and both well known to you. They were: Mr. Geo. G. Ramsdell, then President of the American Gas Light Association, and Mr. Wm. McDonald, the President of the Western Gas Association.

There were 13 foreign technical societies represented at the Congress as follows: Two from England; one each from Germany, Austria, Belgium, Holland, Italy and Switzerland, and five from America: The American Gas Light Association, Western Gas Association, the Society of Gas Lighting (New York), New England Association of Gas Engineers, and the Pacific Coast Gas Association.

As there were no less than 29 papers, besides some further reports and communications, I think you will understand that it would be out of the question to review them properly here. If there is any one present, however, who desires particular and detailed information on any of the subjects which came up for discussion, I shall be very glad to take the matter up with him afterwards. granting whatever knowledge or assistance lies within my power.

Of the numerous subjects discussed at the convention those which, in my estimation, are of most importance to the gas men of the Pacific Coast are the questions of distribution under high pressure – using small mains and reducing first cost; coal handling machinery – on account of the high price of labor; inclined retorts—the success and value of which can no longer be doubted; and all the literature referring to incandescent gas burners.

A commission was appointed to consider the question of a suitable standard for the measurement of the illuminating value of high power incandescent gas lights. I believe this question deserves attention in view of the fact that gas lighting by Welsbach burner, has become almost universal.

Gas engines and the sale of gas for heating and cooking purposes, did not seem to me to receive the amount of attention deserved, notwithstanding the fact that gas stoves are used in great numbers, and I gained the impression that gas engines are used more generally there than in our own country. The popularity and use of gas stoves and engines are, of course, governed almost entirely by the price of gas. I will say, however, that I firmly believe that gas engines are not used enough by the gas companies themselves on this Coast. I noticed numerous places in England where they were in use about the gas works and giving satisfaction.

You will be interested in knowing how important a part was played by gas in lighting the exposition grounds and in the numerous exhibits identified with the gas industry. To this end I have placarded a small plan of the grounds where it can be examined by members, showing in red all gas exhibits and places lighted by or using gas, and further elucidated by notations.

One building of moderate size, devoted exclusively to gas exhibits, was known as the Pavilion of the Gas Industry. It contained nothing of startling interest, with the exception of a great number of photographs of gas works from all parts of the country, and to which I devoted a good deal of time, as well as to a classified list of the French towns using gas, and giving the date when it was first introduced.

Gas engines of all conceivable designs and sizes were represented in great numbers, but the one about which the greatest interest centered was a large, single-cylinder, horizontal engine made by a Belgian firm and rated at 1,000-horse power with city gas and about 700-horse power with furnace gas. It was started up every afternoon at 2 o'clock and always drew a crowd.

A large portion of the gas engine exhibit was situated at Vincennes, a wooded park outside the walls of Paris, and a long journey from the main grounds of the Exposition. It was here also that the acetylene gas building was located. This particular "annex," so-to-speak, was principally for such heavy and cumbersome exhibits as railroad engines and cars.

The most interesting feature of the illumination of the exposition grounds was the marvelous lighting of the Champ de Mars and the Trocadéro, entirely by means of incandescent gas lights. It was effected by two separate systems: The one supplying gas under normal pressure, the other burning the gas under a pressure of 200 m.m., or about 7⅞ inches. I regard it as a great triumph in gas lighting, and I venture to say no such outdoor illumination had ever been seen before. Time will hardly permit of a detailed statement, but the general results were as follows:

Total hourly consumption of gas	48,852	cubic feet.
Total intensity of light furnished	873,600	British sperm candles.
Gas consumed, per sperm candle of illumination	0.0558	cubic feet.
	=17.92	candles per foot.
Number of lamp posts	1,076	
Number of lamps	1,684	
Number of mantles	4,619	
Area { Champ de Mars	1,076,400	square feet. }
Area { Trocadéro	1,022,580	" }
	=2,098,980	square feet.

The illumination of these same places was done by electricity during the Exposition of 1889, and was considered fine, although it was equal to only a little more than one-tenth that of 1900.

On Tuesday evening, September 4th, the Paris Gas Company displayed at their warehouse a variety of gas appliances for the edification of members of the Congress, and on Thursday, the 6th, the whole assemblage was taken down the Seine by special steamers to visit the works at Clichy. This I found was a great, big, old-fashioned coal gas plant, and interesting mainly on account of some of its remarkable peculiarities. I learned that the franchise under which the Paris Gas Company operates will expire within a few years, and as there is much uncertainty as to whether it will be renewed by the government, the Company is spending no money in betterments at the works.

A concise printed description was distributed to the visitors (from which I have taken a few figures), indicating the size of the works. It covers an area of about 42 acres, including a coke shed with mechanical appliances for separating into sizes, transporting and piling, as well as a coke drier; a sulphate of ammonia works and a factory for making cars, etc., for the various transportation purposes of the Company.

The mean annual make is 35,300,000,000 cubic feet. which is a little less than one-third of the total make of the Company. The maximum daily production is 14,120,000 cubic feet of gas. The annual consumption of coal is 314,944 tons.

The mechanical coke handling machinery of the Clichy works formed the subject of a paper at the convention, and was treated in great detail, though I confess I failed to appreciate its advantages from the point of economy or expedition.

The purifiers were remarkable for their number, there being 124 boxes, and of small size; 8 feet by 12 feet, I think.

There are seven holders having a total capacity of nearly 7,600,000 cubic feet, but so odd in appearance that I had difficulty in convincing myself that they were really in use at the present time. They are all low, and, I think, single-lift holders with inlet and outlet connections from a stand pipe near by to the crown of the holder made with articulated flexible joint. I afterwards found that this was at one time a favorite type of construction in France.

A few general remarks upon street lighting in Paris as well as in other European cities will be of interest. Paris is said to be the best lighted city in the world, and I think no one who has enjoyed the privilege of seeing that wonderful city will attempt to deny the statement. Berlin, however, and, I may say, Vienna are not far distant rivals. In Paris one thing which very soon impresses itself upon the observer is the fact that the streets are so lighted as to give an almost uniform illumination everywhere, and absolutely no thought seems to be given to expense. If there is a dark corner anywhere, a light is soon placed there, and the brilliant effect of myriads of white steady lights every way one looks is indeed impressive. One remarks immediately the comparatively few electric lights, in place of which it seems to be the policy of the municipality to use large numbers of Welsbachs (or Auer burners as they are called in Europe) on single, double and candelabra posts—if I may use the expression—each lamp often containing more than a single burner, and sometimes as many as five. The main boulevards have in some instances more than simply the usual lights at each curb, as, for example, the great Avenue des Champs Elysée, with its six parallel rows of incandescent gas lights, which, instead of being placed alternating on either side of the sidewalk or driveway, are opposite one another—abreast and in line, like an army of soldiers.

One often hears the question raised as to the comparative values of arc lights and incandescent gas burners in regard to lighting effect. I had an excellent opportunity to observe this in Paris. Standing at the Place de l'Opera (and, by-the-way, directly under the rooms where the California Commission headquarters were located), it was possible to see the full length of two of the best known streets in Paris without changing one's position, and to note, on the one hand the Avenue de l'Opera lighted by electric arcs, and on the other hand the popular Rue de la Paix, lighted entirely by clusters of incandescent gas burners mounted on ornamental bracketed posts, and placed opposite each other all the way down the

street. It affords a very good example of the advantage of multiplying units as opposed to the idea of lighting by higher power lights at greater intervals.

In the matter of arc lights, I observed that, almost universally in Europe, they were inclosed in white porcelain or opal globes to soften and diffuse the light, and were mounted upon very low poles, generally with some attempt at ornamentation. On the whole, the electric arc lights are far more satisfactory in Europe than with us, giving a much steadier light, in my opinion.

Considerable high pressure incandescent gas lighting is being tried in England and on the Continent, with good results. Some effort in this direction would not be out of place with us.

You will be interested in the following extract from a letter written me by Mr. Lazard Kahn, one of our members who enjoyed the distinction of being on the Jury of Awards at the Exposition. He writes:

"The use of gas appliances there is extensive and popular, and growing more so all the time. Outside of England, Scotland and Ireland, there are very few gas ranges sold abroad. So-called hot plates almost monopolize the Continental markets. On the other hand, gas heating stoves are more popular and more largely in use than with us. They are larger, more elegant and much more expensive than the heaters sold in this country. In truth, prices generally at which all classes of gas appliances are sold to the consumer are probably more than double as high as the prices here. Very many companies rent stoves to consumers. Othere sell them outright. Many of the companies maintain a well organized system of inspection and thereby keep appliances in good order and promote the larger use of gas. In respect to efficiency, American stoves are in my opinion far superior to the average produced or sold abroad. The price of gas has been gradually reduced there, and wherever this has occurred increased consumption for fuel purposes has followed. American stoves can be improved, but the demand for low prices seriously interferes. It is evident that the future of the gas industry was never more bright than now, and I congratulate this great industry and the men engaged therein."

I can say no more nor better on the subject of stoves than what I have just read you, and will now ask you to turn your attention to a few remarks I have to make upon some of the gas works I visited besides the Clichy plant. Glasgow (Scotland) is operated on municipal account, and apparently to the entire satisfaction of everyone. Certainly nobody could complain of gas at 54 cents per 1,000, which is the price at which it sold in 1899. I was informed that it would probably be increased somewhat this year, however, on account of the exorbitant and unheard-of prices now demanded for coal. They have been paying as high as 16s. ($4), which is enough to make a Scotchman turn in his grave. Something like 9s. or 10s. (say $2.50) would be more like the proper thing. This, coupled with the fact that the wages of the employees range from 20s. to 25s. per week for an 8-hour day, explains why gas is sold there so much cheaper than on this Coast. We have all been confronted with this or similarly unfair comparisons by the advocates of municipal ownership at one time or another, and I shall be pleased to make a more critical analysis of the question with those who are particularly interested. I have a full report of the Glasgow works. Aside from the laborers' wages, the salaries paid collectors and others in like positions are far below those paid for similar duties in our own part of the world. What would our collectors think if their earning capacity were limited to about $535 per annum, or a monthly salary of, say, $44.50? This is the case in Edinburgh. Another most important factor in the case is the amount of gas made which, of course, seriously affects the price at which it can be profitably sold. Suppose all the gas burned in the whole State of California were made right here in San Francisco, is it not a reasonable conclusion that a sweeping reduction could be made in the selling price, due to a thousand-and-one economies incident to the great wholesale manufacture of any commodity? Even were this the case, there would not be enough to supply more than half the citizens of Glasgow. To be more exact: The *maximum* daily consumption of all California is only about ⅘ths of the *mean* daily consumption of the city of Glasgow.

Glasgow has three separate manufacturing stations, two of which I visited. There is nothing of extraordinary interest about them, though I might mention the fact that there I saw for the first time some very large holders, and enjoyed the novel experience of going down into the pit of a newly constructed giant, rated at 6,500,000 cubic feet. It looked a trifle larger than what I had been brought up on, but I soon got used to these monsters, so when I reached London and saw the biggest holder in the world, with a capacity of 12,250,000 feet, I actually think I was not properly impressed.

Not long ago, Mr. Foulis, Chief Engineer of the Glasgow Corporation Works, compiled a pamphlet concerning proposed new works at Provan, which I trust will be of some interest. I quote as below:

"The gas works have now been in the possession of the Corporation for 30 years. At the commencement of that period the quantity of gas made per annum was 1,296,000,000 cubic feet. During the financial year just ended the production of gas amounted to 5,969,000,000 cubic feet.

"The increase during each decade is shown in the following table:

Year.	Cubic Feet Manufactured.
1870	1,295,863,000
1880	1,859,582,000
1890	3,058,277,000
1900	5,969,110,800
Average per diem	16,353,728

"The existing works have been extended from time to time to meet the increasing demand, until now there is no room for further extension.

"The necessity for the construction of new gas works has been evident to the Gas Committee for the last five or six years, and during that time the suitability of a considerable number of sites has been carefully considered. The principal difficulty experienced in the selection of a site arose from the necessity of getting a piece of ground of sufficient extent entirely free from coal workings.

"The area of the site selected is 131 acres. It is conveniently situated for both railway and canal communication. The levels are somewhat irregular, but advantage will be taken of the difference in levels to facilitate the transference of material. The coals, lime, etc., will be brought in at a high level, and the coke and other materials sent away at low level.

"The works when completed will be in four sections, each section forming an independent works, which will be capable of manufacturing 12,000,000 cubic feet per day, or a total of 48,000,000 cubic feet.

"Only the first section will be constructed at present. This will consist of two retort houses, 390 feet long by 78 feet wide, each containing 720 retorts; a coal store, having a capacity equal to 50,000 tons; a purifier house, 503 feet long by 89 feet wide; also exhauster and meter houses, offices, workshops, etc., and all the necessary apparatus. There will likewise be two gasholders, each capable of containing 8,500,000 cubic feet.

"The works have been designed, and mechanical appliances will be introduced wherever possible, so as to reduce the cost of manufacture in every department.

"All works for distilling tar and ammoniacal liquor will be erected at the northeast corner of the site. The tar and liquor will be pumped direct from the gas works to these works as produced.

"Railway siding accommodation will be provided sufficient to deal with 4,000 tons of material daily. The total length of railway lines inside the works will be about 8 miles, and in addition there will be about 5 miles of 2 feet 6-inch gauge lines for conveying coke, waste, lime, etc.

"It is hoped that the first section of the works will be completed in 3 years, and every effort will be made to accomplish this, as at the present rate of increase the producing power of the existing works will be completely exhausted before that time."

Of all the gas works in England and on the Continent, that which is attracting the most widespread attention just now—and deservedly, too—is the new municipal plant of the city of Zurich, Switzerland. There coal handling machinery, inclined retorts and all the most approved methods, machinery and appliances have been installed, and the plant seems as satisfactory and as perfect as human ingenuity could make it. A paper on this subject was read at the Congress, and I have here today a complete description of the entire plant, by Mr. A. Weiss, the engineer, all of which, being printed in English, will give those who so desire an opportunity to learn how they do things in Switzerland.

After an exhaustive description of the works, Mr. Weiss draws the following conclusions in reference to the transport of coal at the gas works:

"(1.) The transport of coal must proceed automatically by machinery from the railway wagons to the retorts, by means of other than animal power.

"(2.) Gas, water, steam or electricity may be the source of power. Electricity, however, is the most suitable, as electro motors are specially fitted to work in places where there is much dust and smoke, and also need but little inspection.

"(3.) If cheap electrical or water power is not available, it is best to raise steam for the production of electrical power by burning coke breeze on the Kudlicz or Perret grate.

"(4.) Only small coal or nut can be dealt with by conveying plant; hence large coal must be broken before it is stored.

"(5.) The machinery must be simple and strongly constructed, so that it can be readily attended to by the workmen. There must be few parts exposed to wear, and the lubrication must be effected in as simple a manner as possible.

"(6.) Unnecessary machinery must be avoided.

"(7.) From this last condition, it follows that settings of inclined retorts are best adapted for working by machinery.

"(8.) With each type of coal conveying apparatus, an adequate reserve plant must be provided, in order that there may be no interruptions of the work.

"9.) The coke, moreover, must be transported by machinery as soon as it leaves the retorts."

The results attained are as follows:

"(1.) Working, which is quite independent of the favor and whims of the staff of workmen. In times of epidemics, war or strikes, full work can be maintained with a mere handful of untrained men.

"2.) Simplification of working, great reliability and increased productive power.

"(3.) Decrease in the number of workmen, and lighter work. The workmen secure more intervals for rest, and their work can be properly done if they attend for 10 hours a day—actually working for about 5½ hours only. Thus the 8-hour day, which is claimed on social grounds, may be regarded in years to come as purposeless.

"(4.) The stokers are in no way concerned in the transport of the coal, and, therefore, are at liberty to devote greater attention to the settings.

"(5.) All coal transport is discontinued at night, as it is finished in a few hours in the daytime.

"(6.) Gas works having a minimum daily make of 3,000 cubic meters (nearly 106,000 cubic feet) of gas may unhesitatingly adopt mechanical transport of coal or coke.

"(7.) It has been demonstrated that simple means of forwarding coal are perfectly practicable from the technical standpoint, and, moreover, are attended with the greatest financial advantage.

"This communication embodies the results of exhaustive study and numerous trials, and is based on practice and not on theory. The results have been fully substantiated by 2 years' operations at the Zurich gas works. In conclusion, it may be pointed out that the considerable economies effected by the use of mechanical conveyors for coal and coke will enable greater support to be given to benefit schemes; and the social welfare of those employed will thus be furthered in the manner advocated by Herr W. von Oechelhaeuser."

Having already taken up much of your valuable time, and with the conviction that I have but imperfectly discharged my duty towards you, I will bring my remarks to a close, with the advice that whenever an opportunity presents itself to come in contact with others who are laboring in your own chosen field, seize upon it and hold it fast. Go, whenever you are able, into the works of other cities, be they far or near, great or small, for the good it does one is more than words can tell. It lives with you long after your travels have sunk into the oblivion of years. Is it not for this reason you have all traveled so many miles to be here to-day?

Comparison of Methods of Secondary Distribution of Alternating Currents.

[A paper read by Mr. George C. Holberton,[1] of Oakland, Cal., before the Ninth Annual Meeting of the Pacific Coast Gas Association.]

It was the original intention of the writer to select certain districts which we are supplying at different voltage and by different methods, and make a detailed comparison of the cost of copper, transformers, meters, etc. It soon became apparent, however, that this would make too long a paper, and one so full of details that few would care to wade through it; so I have endeavored to show the results of such a comparison without boring you with the details.

There are still in existence a few stations which operate with 52 volt, 2-wire secondaries, but these have so nearly disappeared that it would not be worth while to consider this method in making the following comparison. The remaining methods of supply may be classified somewhat as follows:

Individual transformers for each service; secondary networks, fed by transformers at intervals; a combination of both of the above.

The first class is very unsatisfactory, except in a few special cases, such as those where it is used to supply a fixed load for a certain number of hours, and where the transformers can be cut out of service when not in use. This last can rarely be done, and the result is that when transformers are used to supply individual services they are idle about 20 hours out of the 24. This means not only a large amount of idle capital but a large coal consumption to take care of the core loss of these transformers; particularly is this so when supplying a service of 24 hours' duration. Another great objection to using individual transformers on each service is the poor regulation which ensues, due to the variation of the voltage of the transformer secondaries under extreme changes of load.

In cases where we are forced by circumstances to supply current in this way, we find that basement lamps, closet lamps and others, that are used during periods of light loads on the transformers, are burned out very rapidly owing to excessive voltages under light loads.

The secondary network, fed by transformers at intervals, is undeniably the best service for a business district, and in districts where the services occur close enough together to warrant it. Theoretically, the proper way to do would be to figure in each district the cost of copper, transformers, etc., to supply by means of the secondary network, and also the cost of copper, transformers, etc., to supply by the individual transformer method.

In making the comparison care should be taken not only to consider the cost of the original installation, but also the difference in the core loss after the installation has been made; that is to say, you can safely afford to spend an amount of money in additional copper for the secondary network over the individual transformer system, the interest of which amount would be equal to the fuel saved by the smaller core loss in the secondary system using large transformers. In fact, more than this amount can safely be spent, as you are pretty sure to obtain more customers in the district after the service is laid out, and in the case of the secondary network, this increase can readily be provided for by putting in larger copper without suffering any loss, except the interest on a small amount of additional capital for copper; whereas, if larger transformers are provided in the individual service, you must suffer the core loss in addition to the interest on the investment.

Another advantage in the secondary network is the diminished liability to break down. Large transformers are less liable to burn out than small ones, and with a tied-in network the balance of the transformers will take care of the load until the burned out one can be replaced.

Our standard size in Oakland for the business district is 300-light capacity, and so far we have not had a single burnout, although these transformers have been overloaded on several occasions.

Another consideration in this matter is the difference in the total capacity of transformer necessary to supply a given number of lights installed. In the case of the individual transformer system, the transformer must be installed equal, or nearly equal, to the total number of lights connected to the service, although this number of lights may only be turned on 2 or 3 times in the year. On the other hand, with the secondary network a much smaller capacity in transformers is required, due to the fact that it never happens that everybody has all the lights turned on at the same time. We are operating, in the residence districts of Oakland and Berkeley, a transformer capacity ranging from ⅓ to ⅛ of the number of lights installed, according to the size of the district which we are supplying and the character of the load.

When possible it is best to lay out the secondary network in such a way as to include both stores and churches in the same tied-in network. By doing this the transformer capacity required for the churches is available on Saturday nights, to help out the peak of the store load, and on Sunday the capacity required for the stores is available for the church load. We have in Oakland a district particularly adapted for this method, as there are four large churches within a few blocks of the heaviest business district.

In the case of the individual transformer system it will be generally found that, if we take the actual copper necessary to carry the load on a given drop, the copper will be found to be smaller than required to give mechanical strength. This is particularly true when the high potential side of the system is operated at 2,000 volts or more. Except in rare cases the writer prefers to use nothing smaller than No. 6 copper, particularly in districts where there are trees and the liability of limbs being blown against the wire. With this limitation placed on the method of distribution by individual transformers, the extent of the secondary system fed from one transformer becomes a matter of the potential which can be used.

The most common practice in the residence districts, and particularly in the smaller plants, has been to use a 100 volt, 2-wire secondary network. In the larger cities, and in a few of the smaller plants, this has

1. Engineer electric division, Oakland (Cal.) Gas, Light and Heat Company.

been changed to a 3-wire secondary network, with 200 volts between the outside wires, and the house service either 2-wire or 3-wire, in the former case balancing the different services against each other to even the load on the mains.

In Oakland and Berkeley we are experimenting with a 3-wire system of distribution, using 422 volts across the outside wires and putting in 2-wire, 211-volt services in the houses and balancing the load as closely as possible on the street mains.

This last method brings us to the real purpose of this paper; that is to say, to compare the methods of secondary distribution at 100 volts, 2-wire, 200 volts, 3-wire, and 400 volts, 3-wire.

At first glance this last method would seem to be the ideal one, when we consider the large saving that can be made in copper; however, there are a great many things to be overcome before this can be brought into general use. In the first place the houses and stores have been wired for a 3-wire service using 100-volt lamps. In order to utilize the existing wire it would be necessary to go to a great deal of expense, owing to the insurance rules covering inside wiring over 300 volts. The Board of Fire Underwriters considers 500 volts and under as low tension current, but where a difference of potential of over 300 volts occurs, the separation of the wires (4 inches) is so large as to prohibit the using of ordinary branch blocks, it being necessary to split neutral wire and use separate branch blocks.

Another thing that bothered us in introducing this system was the difficulty of procuring apparatus constructed for 200 volts. This difficulty is being overcome by the demand that now exists for 200-volt material, and many things can now be procured for 200 volts which could not have been bought a year ago.

In Oakland we are carrying in stock fan motors, sewing machine motors and all candle powers of lamps, excepting miniature lamps for 200 volts. One stumbling block that we found, which, though apparently a very trivial one, really prevented the introduction of a 400-volt service, and forced us to maintain a 3-wire, 200-volt system in a certain district, was our inability to obtain night lamps. The man who wanted this was a very heavy consumer, and we could not afford to cause any friction by giving him a service where he could not use the night lamps, owing to the fact that his friends in another part of town were using them. We now have the promise of the manufacturers of the "Hylo" night lamps that they will supply us with night lamps for 211 volts, but so far these have not arrived.

In the matter of fan motors it is possible to use small transformers, known as compensators, for reducing the voltage from 200 to 100. The objection to this, however, is that people desire to move their fan motors about from room to room, and as the compensators are too bulky and heavy to be carried about, we use fan motors, wound for 211 volts, as mentioned above.

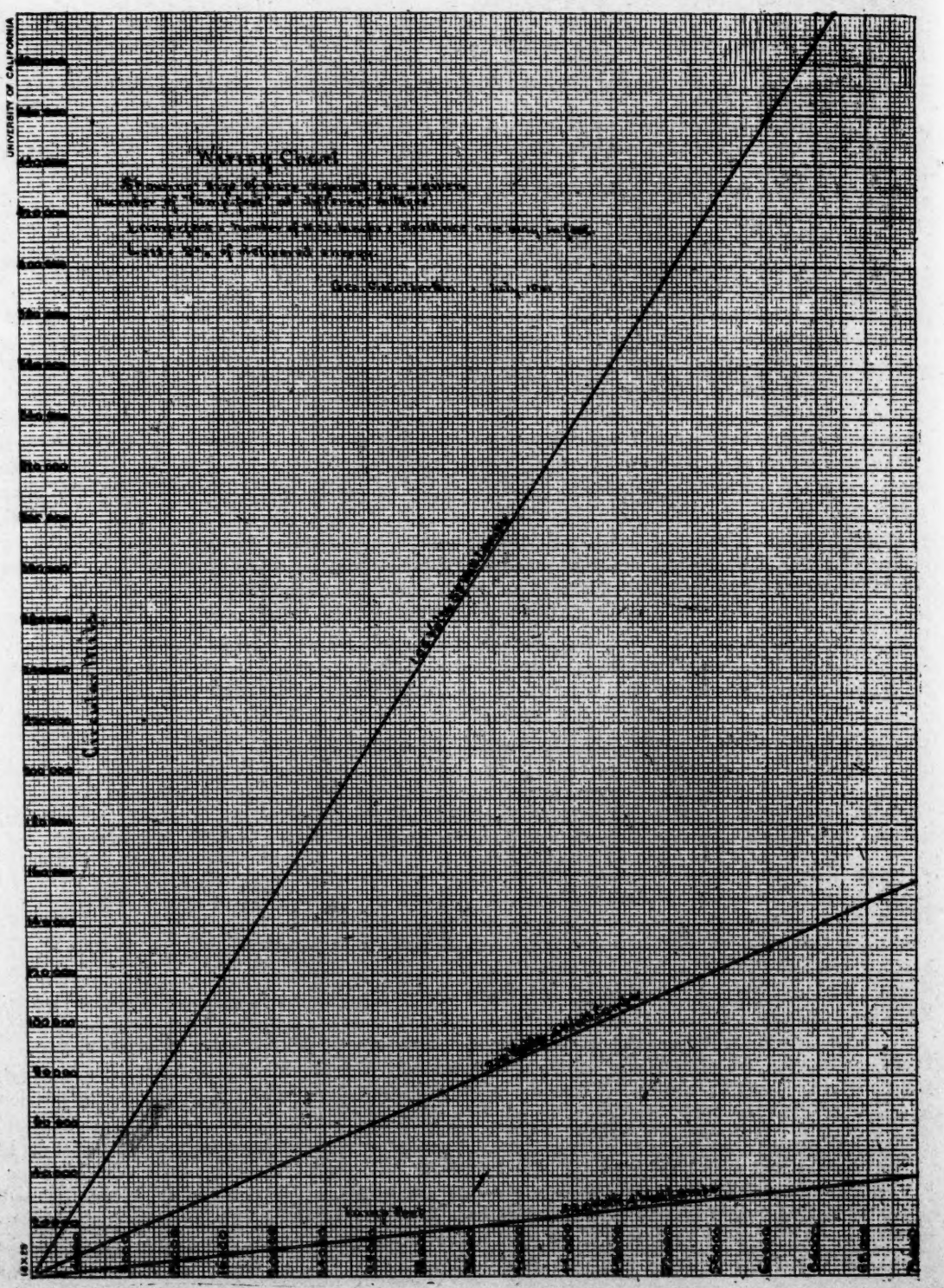
In the matter of inclosed arc lamps, however, we use compensators for reducing the voltage from 200 volts to 100 volts so as to keep all our lamps interchangeable. As these are not moved about, there is no objection to this method.

Having mentioned some of the cases where we encountered difficulties, let me now speak of the advantages to be derived, and I present herewith a wiring chart, showing sizes of wire necessary for a given number of lamp feed at a fixed drop of 2 per cent., which will illustrate graphically the great saving in copper. The 440-volt, 3-wire system, with the same size of copper and the same drop, will supply lamps at about 16 times the distance from the transformers that we could with the 100-volt, 2-wire service, and about four times as far as we can with the 220-volt, 3-wire system; that is to say, the distance we can feed from the transformer with the same size of wire and drop varies as the square of the voltage; this, of course, being in any one direction from the transformer. In other words, we can cover an area 256 times as large with the 440-volt system as we can with the 2-wire, 100-volt system, using the same size of wire and drop and assuming the same load.

If we wish to make this comparison in weight of copper or in dollars and cents, we must compare the 440-volt, 3-wire system, using 220-volt lamps, with the 110-volt, 3-wire system, using 55-volt lamps; or, in other words, when comparing the 440-volt, 3-wire system with the 110-volt, 2-wire system, we must deduct from this saving the weight of the neutral wire, the sizes of which will vary with our ability to balance the 2-wire services.

This would seem to be the solution of the proper method of reaching a large class of resident consumers in a thinly settled district. As a rule, this business is extremely unprofitable, as you generally have to supply current at the same price as you do "down town."

Another bad feature of resident lighting is the character of the load, it being a "peak" load in which the peak occurs at the same time as the peak of the store load where stores keep open in the evening. Then, too, it is necessary to give a 24-hour service in order to give satisfaction and the core loss of idle transformers becomes a serious problem, which



can only be overcome by using a minimum number of transformers with long secondaries and carrying a high voltage to cut down the copper.

The argument may be brought up that the cost to the man who wires the house will be greater using material for 200 volts. This, however, in the majority of cases is not so, as the saving in copper will more than compensate with the additional cost of the material used. At present the insurance companies are insisting on a grade of material for anything under 300 volts that leaves no distinction between 100-volt and 200-volt material.

In Oakland we have an inspector who inspects the wiring at the time the house is being built, and also when the house is all ready for connection to the service. We do not connect until we have heard from him that everything is in accordance with the rules of the National Board of Fire Underwriters. And, in addition to this, we have notified all wire men doing work in Oakland that everything which they install must be suitable for 200 volts, even though we may at present render a service of 100 volts.

In the old districts downtown, where there are a great many 3-wire, 200-volt services, and where we have a 3-wire network with 200 volts between the outside wires, we are connecting the consumers which come on now 2-wire 200 volts across the outside wires of our secondary network. This does away with the necessity of a heavy, neutral wire on the secondary mains; and in addition to this, the 100-volt service will become a smaller and smaller proportion of the load on the network, and we hope that at some future time, as the buildings are improved and the wiring changed, that we may be able to operate entirely with the 200-volt service in the buildings and change to 400 volts on the street mains.

It was at first hard to insist on all of the wiring being done for 200 volts, due to the fact that it was difficult for the wire men to obtain the proper material. This we have overcome by keeping a stock of suitable material, which we are selling delivered in Oakland at the same price that the wire men could get their supplies in San Francisco. In most of the stations it would not be necessary to do this, but we are so close to the San Francisco market that it is necessary in our case.

To show you that this material is actually made and on the market, I take pleasure in presenting samples of some of the material which we are using, which will show you the improved construction, and I will certainly urge you all to have as much of this class of work on your system as you can, as the day will undoubtedly come when we will find our secondary copper too light, and it will be a great deal less expensive to change your consumers to 200 volts than to multiply your copper by four.

In our own case, owing to the fact that we buy in fairly large quantities, we are able to sell 200-volt, fan motors and other apparatus to the wire men and other local contractors, just as cheap as they could buy 100-volt material in San Francisco, so no hardship is inflicted on them, and still make a small profit ourselves.

In the matter of lamps, I would say that our experience with 200-volt lamps has been very satisfactory. In buying the lamps, the best result will be obtained by using a 4-watt lamp under the same conditions that you would use a 3.5-watt, 100-volt lamp, and a 3.5-watt, 200-volt lamp under the same conditions that you would use a 3.1-watt, 100-volt lamp.

At the present time, in order to obtain the 440-volt service from standard transformers, we are using 2 transformers in their primaries connected in multiple and their secondaries in series as shown. This, however, is open to some objection, as there is more core loss in two of these transformers than there would be in one transformer twice the size, and also the regulation is not so good in the case of the two transformers.

We have already opened negotiations with makers of transformers in reference to supplying us with transformers wound for 2,000 and 4,000-volt primaries and 200 and 400-volt secondaries. I should advise those who are now operating at either 200 or 100 volts to buy their transformers wound for 2,000 and 4,000-volt primaries rather than for 1,000 and 2,000 volts. Transformers so wound will cost a little more, but if your primary wiring becomes too light you can change to 4,000. There is an additional advantage due to the growth of power transmissions from water powers. Most companies so transmitting power would prefer to deliver same at 4,000 volts rather than 2,000 volts, and it would seem, from looking over the recent installations, that the general tendency was to step from 2,000 volts to 4,000 volts just as in the past few years nearly all of the companies have given up 1,000 volts for 2,000 volts.

In our own case we are operating our feeder which supplies the town of Berkeley at 5,000 volts. So far it has given us no more trouble than we would have experienced operating it at 2,000 volts. At the time the lines were built we used special porcelain insulators, but the writer believes this was unnecessary; and we have since put up extensions on this line on which we have used the ordinary, deep-groove, double petticoat glass insulators with perfect satisfaction. In this case we step down at various points from 5,000 to 2,000 volts, but our experience with 5,000 volts has been so satisfactory that I believe it will be better to distribute at 5,000 volts, direct stepping down to the voltage of your secondary mains without the intervention of the 2,000-volt transformers.

Promotion of Domestic Fuel Gas Consumption.

[A paper read by MR. R. P. VALENTINE,[1] of Sacramento, Cal., before the Ninth Annual Meeting of the Pacific Coast Gas Association.]

Prefatory Remarks.—A railroad company was once sued for damages by a lady who had been injured in an accident. On the jury was an Irishman who refused to vote in accordance with the balance of the jurors. When asked his reason, he said: "Begobs! I made up me mind it was the railroad's fault; but they couldn't help it."

I wish the gentlemen of the convention would bear in mind that I am like the railroad company—it's my fault I am presenting this paper; but I can't help it. And I hope that (unlike the Irishman) you will express more decided views in the discussion which I hope my effort will produce.

Some years ago a cloud loomed upon the horizon of a prosperous and almost unopposed gas trade. Forced by the ever rushing trade winds of progress, drawn on by the magnetic power of popular demand, aided in its flight by the steady breeze of electrical invention, and laden, as it was, with the facilities which render modern electric lighting, both for business and domestic purposes, so cheap, so accessible and so reliable, it took but a short while to make itself indeed ominous to a trade which had hitherto almost restricted itself to a wide and lucrative lighting business.

The bright and long-standing prospects of the gas business began to be dimmed. The threatening storm found a most potent fountain in the increasing use of arc lights and the development of commercial incandescent illumination. Then, with hydraulic force, came the introduction of long-distance electric transmission, a system which, with a few years' development, rendered electrical supply almost inexhaustible and exceedingly economical.

Would utter discouragement be surprising under these conditions? Was it remarkable that many an old member of the trade declared (thanks to his conservativeness) that the nadir of the gas business was reached, that the old prosperity was at an end?

It is safe to say many were discouraged; but the discouragement did not last. The gas man as a rule is not a "give it up" man. Competition but served to rouse him, to draw him into the business whirl. The latent energies within him came forth. He became a typical man of business—energetic, resourceful, ever ready to grasp an opportunity. Upon the reliable foundation of the veteran company he built a new business. Necessity had compelled him to search the fields of commerce for other chances. His recently enhanced propensity for expansion showed him the one straight path to the pinnacle from which he had been forced. He saw the great opportunity offered by the neglected domestic fuel gas trade. Then, from the deluge under which he had so recently labored, the gas man came forth a veritable Prometheus, offering the modern flame which warms the hearth of contentment, and places rest in the body of the weary housekeeper.

Upon entering into the gas business the condition of affairs which I have described became apparent to me, and I established a policy with my company of exerting every sinew in the endeavor to propagate the demand for gas cooking and heating purposes. Of course it was necessary to hit upon the proper method of introduction. Spirited attempts at extension were new to the company. Several plans were studied and tried; finally, experience taught us the best methods.

The California State Fair was about to be held, and we engaged space in a conspicuous locality. We arranged our booth as neatly and artistically as possible, and then proceeded to hire a lady cook whom we knew to have a glib tongue.

Nearly every evening during the fair we served hot biscuit and butter; also, circulars and pamphlets. We varied this menu occasionally by serving roast beef sandwiches, after having cooked the bread and beef in view of the numerous visitors. It need not be said our booth

1. Superintendent Capital Gas Company, Sacramento, Cal.

became quite popular. What else could you expect, when our pathway to popularity was paved with biscuit and sandwiches?

Notwithstanding the fact that the State Fair was held in the month of September—a time of year when the demand for cooking stoves is logically weak—our output of that article was very materially increased; a result which we could trace directly to our recent novel effort at advertising.

To keep your card ever in the public eye has proven itself to be most essential. Constant advertising in the local newspapers is indispensable. Endeavor to develop such a degree of public interest that you constantly overhear conversations in the street cars, on the street, and even in social gatherings, regarding the articles you advertise. Remember that the use of gas stoves is mainly of interest to the women folk; therefore, word your advertisements so as to affect the dispositions and indispositions of the feminine sex—it need hardly be said that pithy and catchy phrases are most desirabie.

One of our methods is to form a list of non-consumers along a certain branch of our mains and to mail directly to them a copy of specially prepared pamphlets. Shortly after receiving these pamphlets the parties are visited by our solicitor, who must needs be pleasant and gentlemanly, as his business exists mainly with the ladies. The result of this method is surprisingly successful.

Never lose an opportunity to advantageously display a stove or heater. Be sure all cooking schools make use of gas stoves. When the cook is converted, half the battle is won. Supply lunch counters and coffee parlors, also demonstrators, with a stove. Their efficacy then becomes self-evident.

Above all things we aim to obtain the friendship of our patrons, being ever ready to respond to the slightest complaint. We keep the stoves or appliances of our customers in perfect working order whenever practicable, and make a practice of renovating and repairing old stoves, which have become useless to them, free of charge. Expense engendered in this manner will rebound with interest, and the good will of an outsider thus begot is invaluable.

The use of hot plates should be discouraged, as they lessen the sale of ranges, and can only be regarded as a summer convenience, whereas ranges become a staple and permanent fixture when one has done his duty by dispelling the bugaboo of gas stoves being only agreeable to summer use.

In the selecting of a stock of stoves the best in the market should be obtained. It should be remembered that economy is of as much importance to the gas company as to the consumer, for when the bills prove too large the stove goes out of use.

I would also call attention to the uneconomical gas water back as connected to gas ranges. It goes without saying that its construction is such that the water, in passing through the almost horizontal coils, can absorb but very little of the heat expended, whereas by the use of a specially constructed vertical heater, nearly all of the heat is absorbed by the water, because of the circuitous and diverting passage of both heat and water.

The styles of heaters upon the market are multifarious. A large percentage of them are expensive to the user, and are ineffective trade winners.

The deceptive cylindrical, illuminating and blue-flame heaters we endeavor to avoid. Odorous stoves we will not handle. We encourage the use of asbestos back heating stoves, asbestos back radiators, when connected with flue, and parlor grates, as these styles have proved themselves capable of the most satisfying results.

At all times we endeavor to supply appliances which shall prove most economical to the consumer; for a small gas bill is a most potent agent in recommending further purchases.

It will now be seen I have endeavored to express the following principles:

1. Extensive, untiring advertising, in newspapers and other circulatory printed matter, by means of fairs, exhibitions and demonstrations, and by the use of solicitors, is bound to produce the most gratifying results.

2. To be ever solicitous concerning the efficiency of your customers' appliances. To quickly respond to all complaints and grievances is to establish a good reputation; and what is a better advertisement than a good name?

3. To furnish only the best goods the market affords. To supply only such ranges as are known to be perfect cookers, and such heaters as are known to be most conducive of desired results, is to have satisfied customers; and one customer, when pleased, will discover another.

A dissemination of the demand for domestic fuel gas cannot be considered without the question arising: "Shall I rent, sell or give stoves away?" A diversity of opinion exists concerning this problem. By personal experience I have discovered that the method of renting, which corresponds with the method of selling on installments, to be fraught with dangers and detriments. A large floating capital is developed, bad customers are continually encountered, aud one's stock becomes flooded with old and almost worthless stoves taken from non-payers.

The method of giving stoves, or, as it is generally practiced, of supplying stoves on advanced gas credit, can claim but one advantage. It materially increases the output of stoves without necessitating any extraordinary advertising, Notwithstanding the fact that I at one time inaugurated the practice of supplying heaters upon the system of advanced gas credit, I maintain that it is a lazy man's method and is unnecessary, when proper spirit and determination are supplied to the advertising of one's wares. We practiced this system for about a month, at the end of which time our stock of the particular heater which we were supplying became exhausted, and we abolished the sytem. Trouble then followed, we being roundly accused of unjust discrimination. "This neighbor was given a heater; why should we not be given one?" "This office was supplied with one free of charge; why should we be forced to pay?" The method produced many bothersome results, and were glad to dispose of it.

The system which has become standard with our Company is that of disposing of appliances in such a manner that there is no drain whatever upon the finances of the Company. All stoves go at cost price. For time, pipe and fittings we endeavor to derive sufficient revenue to defray the expense of connecting with meter, including the cost of labor, and, in spite of the many prejudices concerning this method, we have succeeded in building up such a demand for gas ranges, water heaters, heating stoves and grates that we hardly dare hope for more.

In conclusion, I beg to offer the following: Be honest with yourself, keep everlastingly at it, and you will reach that Mecca to which every gas man is constantly striving—an almost constant maximum output.

[Concluded from page 207.]

Differential Rates for Gas.[1]

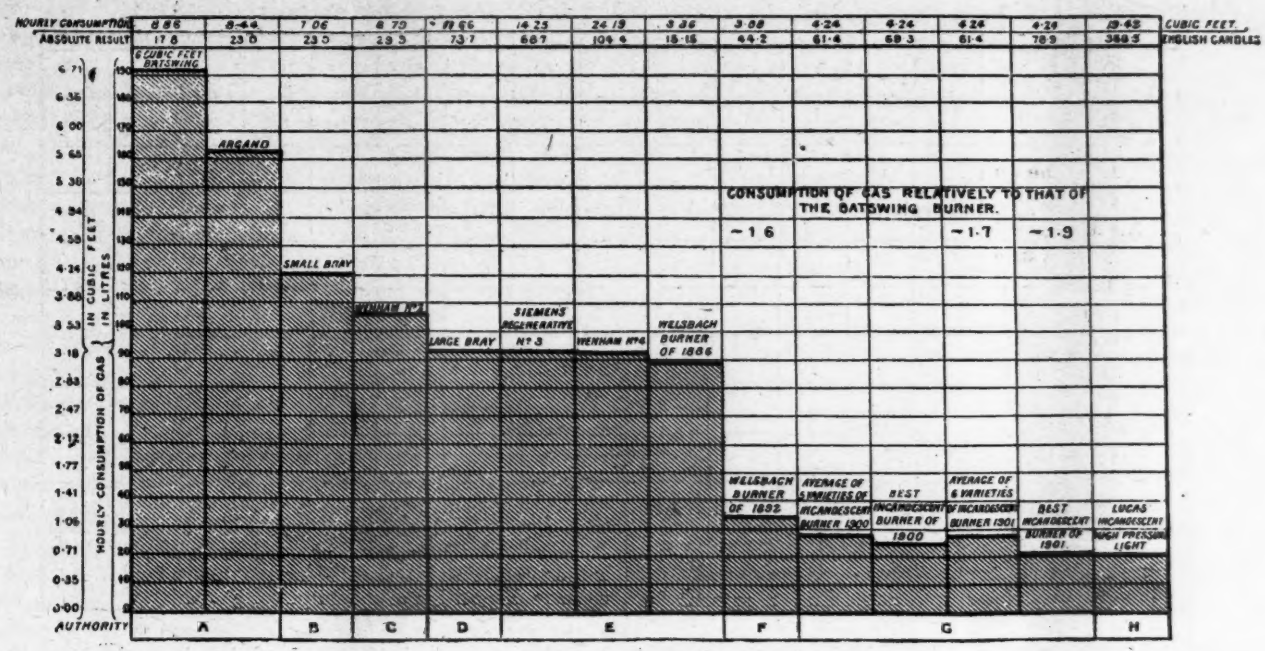
[A paper read by Herr W. von Oechelhaeuser at the Vienna Meeting of the German Association of Gas and Water Engineers.]

There are, therefore, intrinsic and authoritative reasons in support of the system of dual rates on economical grounds, provided in future matters can be so arranged that only a small number of duplicated meters and services are required; and thereby their inconvenience, both in use and in making up the accounts, is reduced to such an extent that it may be completely ignored. There is, moreover, another economical aspect of the question, which makes it look in the highest degree questionable whether the example of a uniform price all the year round should be followed by many works. They are face to face with constantly rising wages, continually increasing prices of coal, and, more particularly, constantly growing chemical competition on the part of coke-oven works in respect of all bye-products, and are therefore in a position in which it seems to the author very hazardous to lower the price of gas for illuminating purposes without absolute necessity—always assuming that the price is a moderate one for the neighborhood in question, and that there are no special reasons for desiring an increase in the consumption for illuminating purposes. Just now there is absolutely no justification for a general lowering of the price of illuminating gas. It would be justified only, on the one hand, by the influence of competition, and, on the other hand, out of regard for the less prosperous classes of the population.

In support of this view, the author would point to the reduction in the price of gas which has taken place from the earliest years of his Company's existence. From average receipts of about $2.12 per 1,000 cubic feet in 1858, there has been an almost continuous drop to about 95 cents last year. On the other hand, the retail price of petroleum (in Germany) is higher now than in 1877; and in some of the intervening years —*e.g.*, 1895—it has risen suddenly to very much higher figures. But of at least equal importance as the continuous fall in gas prices is the enormous cheapening of gas lighting, which is to be attributed not only to the price of the combustible, but to a better duty from new burners and the employment of incandescent mantles. Diagram 3 (p. 249) shows that a source of gas light, 14 English candles mean horizontal intensity, is obtainable through the best incandescent burner of 1901 at one-ninth the cost for gas of what it was through the batswing burner of 1887. Therefore the author thinks that any dissatisfied gas consumer in a place where a moderate gas price prevails may rightly be

1. Translated for the *Journal of Gas Lighting.*

Diagram No. 3.—Consumption of Gas per Hour, with the Most Usual Descriptions of Burners, for the Production of a Light of 14 English Candles Average Horizontal Illuminating Power.



Authorities.—*A C E*, Professor Heim (*Journal fur Gasbeleuchtung*, 1887, p. 671). *B D*, Hutte, 1893, II. *F H*, W. von Oechelhaeuser. *G*, Incandescent Gas Light Photometric Committee.

referred to this fact, and advised to get rid of all old burners and to procure the best new ones. Diagram 3 likewise shows clearly how, even since the invention of the Welsbach light—and, indeed, since that of the improved Welsbach light of 1892—the cheapening of gas lighting has continued to advance, through the improvement of both burners and mantles.

Thus, in the year 1892 the Welsbach burner consumed one-sixth of the gas which had formerly been required in the batswing burner to produce the same light; while the best incandescent light of the present day, and the Lucas high pressure incandescent burner, show only $\frac{1}{9}$ of that consumption. [The value stated for the duty afforded by the Lucas light is an average of 100 hours in use; while the rest of the figures for incandescent burners are average values over 300 hours use. In general, therefore, the Lucas light is not more economical than the recognized ordinary incandescent lights. Its advantage lies in its great power as a source of light.] With the present results of incandescent lighting, however, perfection has by no means been reached, as is clear from the fact that the best incandescent burners so far utilize only 2 to 3 per cent. of the available heat of the gas. Thus, looked at from the scientific standpoint, it seems that considerable advances must still be expected, of which also the activity of the incandescent lighting industry is always affording fresh evidence. On the other hand, an efficiency of 30 per cent. is already attained in the latest gas engines, which compares with a utilization of 15 per cent. of the steam in steam engines. Further advances are therefore only to be expected in a much smaller degree; and assistance to this method of employing gas appears to be justifiable, which, in the author's opinion, is not the case with gas used for lighting purposes.

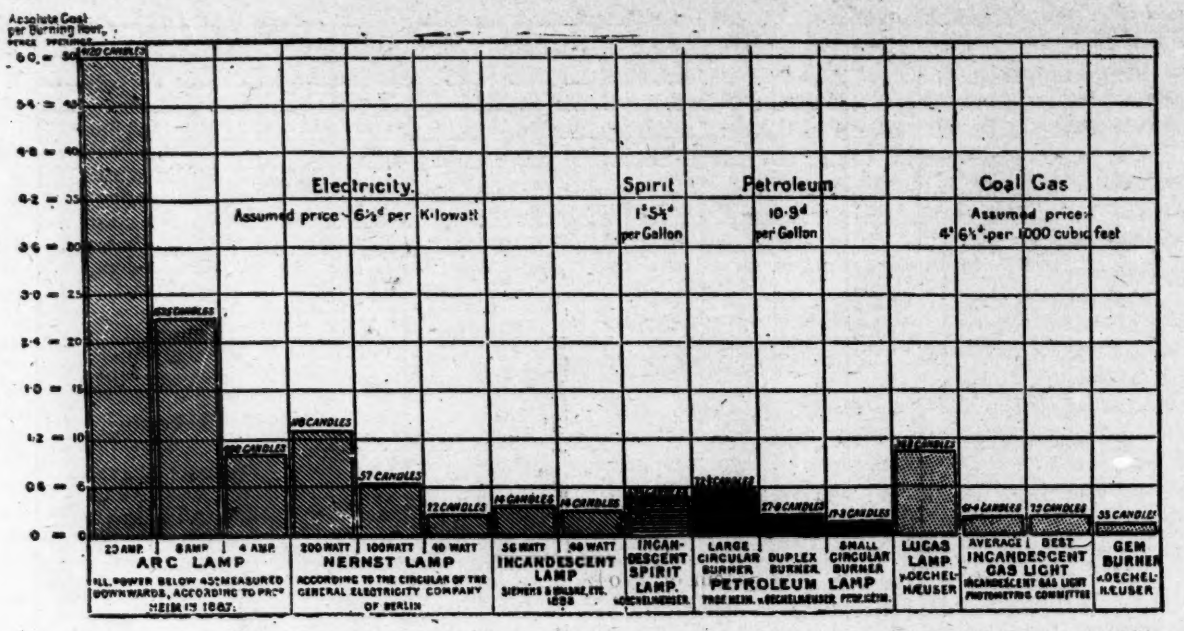
Diagram 3 shows further that there has taken place since the invention of the new Welsbach light nine years ago, a reduction in the cost of gas lighting of about 50 per cent., quite apart from any reduction in the price of gas. Even if the best results of incandescent lighting are disregarded, and only the average of numerous measurements during the years 1900 and 1901 is taken, there is still found to be a cheapening of 20 per cent. By reason of these results, one is indeed forced to the conclusion that, in place of a uniform price being adopted, the price of gas for lighting ought to be kept as high, and that of gas for technical purposes as low, as possible. The example of the electricians would thus be followed, and the difference in the prices rather increased than diminished. Herr Grohmann, of the Dusseldorf Gas Works, has actually followed this plan, and has fixed $1.12 per 1,000 cubic feet for the price of gas for lighting, and 56 cents for technical uses; thus maintaining a difference of 50 per cent. Other municipal gas undertakings have followed on the same lines, though not actually with the same prices as, for instance, Magdeburg, where gas for lighting costs $1.27 per 1,000 cubic feet, and for technical uses 66 cents.

Certainly in many cases it will be possible to rest satisfied with carrying out and maintaining such a system of dual rates all the year through, without proceeding to different summer and winter prices, and thus attaining that more favorable and more uniform disposition of the output of gas which was shown in Diagram 2 (*ante*, p. 206). Anywhere, however, where the consumption of gas for lighting increases too slowly, and the number of duplicated services ought to be rapidly diminished, it is highly desirable to lower the price of gas for lighting in the summer to the price which is charged throughout the year for gas for technical uses. Then consumers of large quantities of gas for heating and cooking, or for industrial purposes, who now employ duplicated services, will give them up, and instead pay the higher price of gas for lighting during the winter, because in the summer—when they use more gas for cooking, for instance—they will secure the lower price without having the duplicated service. On the other hand, the larger consumers of gas for technical purposes, such as the possessors of gas engines, will pay all the year through the lower price for gas supplied by a special service for technical uses, which price will be the same as the summer price for all gas. This, which may be designated the mixed dual-rate system, must likewise be recommended equally with the other system of dual rates throughout the year which is now prevalent, especially for the many cases where it is desirable to reduce the number of duplicated services and meters. In this respect, it affords the whole of the advantages of the system of one uniform rate for the summer and another uniform rate for the winter, while it does not injuriously affect any considerable consumption of gas for technical purposes.

Finally, Diagram 4 shows how gas lighting stands in price with respect to competitors. It will be seen from this that, at the assumed prices, which apply to North Germany at the present time, incandescent gas lighting, when compared even with petroleum, is light for light, still about 66⅔ per cent. cheaper than lighting with a petroleum lamp. Thus, even the absolute cost of a "Gem" burner is about 25 per cent. less than that of an ordinary small circular burner petroleum lamp; while it gives more than twice as much light. Therefore, even with a view to a further extension of gas lighting among the poorer classes of the people, a decrease in the price of gas appears to be unjustifiable, more especially when it is borne in mind that, for the reasons stated above, it is not certain that it will not be necessary within a few years to again raise the price of gas. But it is well known also that the introdnction of gas lighting among the poorer classes depends directly not only on the price, but frequently much more on relieving them of the initial cost of installing it. Hence the author believes that it is more correct economically, and of much greater direct value to the poorer classes of the people, to provide house connections and fittings under the most favorable conditions possible.

For instance, a gas pipe should be laid gratis even to the top floor; and, most important of all, prepayment meters should be fixed. These enable even workmen to burn gas at the standard prevailing price. For the rest, not only competition and economical relations, but also many hygienic considerations—among others, smoke abatement—are strong evidence in favor of gas being disposed of as cheaply as possible for industrial and power purposes, especially to large consumers. For

Diagram No. 4.—Absolute Cost of Running the More Common Sources of Light of 14-Candle Power and Upwards.



small consumers, indeed, the lowering of prices in the summer ought to suffice to induce them to use gas, especially for cooking, without the necessity for duplicated services and meters. Reforms of gas rates should, in the author's view, aim not at a complete avoidance of duplicated services and meters, but at a considerable diminution of their numbers. For examples, it is only necessary to refer to the coal, spirit, and iron trades, in addition to the kindred industry of electricity supply. In the latter, to the best of the author's knowledge, dual rates prevail almost exclusively; and, as already pointed out, the differences between the two rates are more than double those which are found in the gas industry. This system of rates, indeed constrains the gas industry to compete with electricity supply by means of a system of similarly graded dual rates. Electricity works have been founded during the last 10 years chiefly by municipal authorities; and the author is not aware that there has been any impeachment of the system of dual rates as a matter of public policy. No electrician thinks of sacrificing the electro motor to the uniform rate system from considerations of convenience. Gas men, therefore, must take it that it has been fully recognized in electricity supply that the system of dual rates is completely justified on its merits.

While the author has sought to "break a lance" on behalf of different systems of dual rates, he nevertheless, for the reasons mentioned in the beginning, is far from rejecting the uniform rate system under all circumstances. Thus, where, through a rapidly growing population, there is such an increase in gas consumption that it is scarcely necessary to fight against competition, and the gas works' managers concerned have an anxious time in satisfying the natural and rapidly increasing growth, the uniform price is to be commended until suitable land is found for a new gas works. Similarly, many gas works authorities might attach little importance to the consumption by gas engines, because either the prices of electric current are too cheap, in consequence of the existence of water power, or because the electricity works, as well as the gas works, are in the hands of the municipality; and, perhaps, in order that the electricity works may pay, it is still more important to make the consumption uniform throughout the daytime and the summer in their case than in that of the gas works.

Finally, there is the important difference in any question of reform of gas rates between works which are owned by municipal authorities themselves and those owned by private companies. The municipality is a law unto itself in the matter of gas prices, and can easily disregard the dissatisfaction of those classes of consumers, such as the possessors of gas engines, who experience an increase in the price of gas when the uniform rate system is introduced. It is, moreover, in the position of being able readily to increase its price for gas, as has been done by many towns in recent years, when circumstances require such an increase in consequence of rising coal prices and wages. It is another matter, however, with private companies who have to seek such compensation; for every change of rates made by them is naturally regarded only as a new means of enriching themselves. With them also any discontent always excites a powerful outcry—intensified as it were by a sounding board—and consequently they are practically prevented from making any increase in the price of gas. Probably, any discussion of this communication will reveal as many different views and hypotheses on the question as are to be found exemplified in actual practice. It remains, therefore, only to recommend all local authorities who are in matters of policy in the same position as the private companies, or are under similar business conditions, as well as the many municipalities who have done so well under the system of dual rates and great differences between the two rates, not to allow themselves to be ensnared by the seductive charms of the uniform rate system, but, like the electricians, to remain true to the system of dual rates; or, failing that, at least to introduce, by way of compromise, a system of mixed rates, which does not relentlessly sacrifice the large gas engines—which have formerly been the best friends of the gas industry—to the electro motor, and does not ignore the hygienic advantages which accrue to towns from heating by gas on the large scale in industrial and technical operations.

Discussion.

At the conclusion of the reading of the paper, which was received with hearty applause, a lively discussion ensued, of which we give below a translation of the brief official report in the *Journal für Gasbeleuchtung.*

It was opened by Herr Schimming, Manager of the Municipal Gas Works at Berlin. He said that he did not take the author's standpoint; but he submitted that the conditions were different in different towns, and that it was impossible to give one general rule applicable to all cases. Municipalities regarded the matter in a different light from companies, and industrial towns viewed it differently from non-manufacturing towns. In Berlin, about three-fourths of the total consumption of gas went for industrial uses. In particular, the managements of municipal and private gas works adopted different standpoints. Many things commended themselves to the managers of municipal works, which the managers of private gas works could only undertake under compulsion. It might be said that the municipal bodies took a broader and loftier view of the question. The small increase in the price of gas for power purposes in Berlin was of no moment for industrial concerns, as other factors had greater effect on the price of products than the cost of motive power. In Berlin, it was a question of competing with petroleum by means of a lower price of gas for lighting purposes.

To this, Herr von Oechelhaeuser replied at once. He emphasized the opposite point of view—viz., that the public interest generally did not require a uniform price, especially in view of the great benefit to small establishments of a considerably lower price for gas for cooking purposes. Furthermore, it was impossible to compete with petroleum, even with a still lower price for gas for lighting purposes. Public interests, indeed, demanded lower prices of gas for technical uses, not of gas for lighting purposes. At lower prices industrial consumption might be secured, as the construction of Dowson gas plant was generally attended by impossible difficulties in the matter of concessions.

Herr Müller, Manager of the Charlottenburg Gas Works, next spoke in favor of a uniform price for gas for both heating and lighting. Experience thereof at Charlottenburg had been very favorable; and the daytime consumption had increased very rapidly. Especial value must be attached to the great convenience of the uniform price system. Herr Merz, the Manager of the Cassel Gas Works, was of opinion that there

was no reason for adopting the lower uniform price. Charlottenburg experience, indeed, showed that the net number was thus considerably reduced. On technical grounds, also, connected with working arrangements, the uniform price appeared unfavorably. A better system was that of two prices for gas for other purposes than lighting—one for the summer and another for the winter. This system had proved very satisfactory at Cassel. Day meters and night meters should also be borne in mind; they were being introduced as an experiment at Cassel. The question was further discussed by Herr J. Körting, of Hanover; Herr F. Schäfer, of Dessau; Herr Gröhmann, of Dusseldorf; Herr Joly, of Cologne, and Herr Muchall, of Wiesbaden. The opinion that municipalities adopted a different and broader point of view of the question than companies was specially attacked. Experience of the uniform price at Wiesbaden had been favorable, and it had proved to be particularly beneficial to small establishments.

Herr von Oechelhaeuser, in his reply to the discussion, laid stress on the advantage offered by separate services for gas for lighting and cooking purposes in the control which was thereby afforded over the consumption of gas for cooking, and the consequent avoidance of waste. Experience of the uniform price at Charlottenburg had been too brief to be conclusive. If the price of gas for motor purposes was made an exception from the otherwise uniform price, then the system of two prices was again accepted. He concluded by expressing a wish that all efforts directed towards the solution of the question of differential rates for gas might prove of benefit to the gas industry.

Gas for Cooking at the Pan-American Exhibition.

The Pan-American Exhibition, now in good working order at Buffalo, N. Y., has, as a very prominent feature, electricity, and no one interested in modern lighting improvements should fail to spend a few evenings studying the progress made to date in this line; but it is further worthy of note that no attempt was made to use electricity for fuel, notwithstanding the fact that, of all places in the world, Buffalo claims to produce electricity at a minimum cost, as a result of the transmission from Niagara Falls. However, all the catering privileges of the exhibition were let to the Bailey Catering Company, and Mr. Bailey, who has had extensive experience in the largest hotels of Chicago, and also as manager of the restaurants at the recent World's Fair in Chicago, did not hesitate a moment in deciding on the use of gas for all of his ranges and broilers and for heating water for the kitchens as well. Mr. Bailey, having framed specifications for his requirements, finally let the contract for the work to the Detroit Stove Works for the entire equipment. It was extremely difficult to get a perfect photograph of the outfit, as the rooms are crowded and in constant use, wherefore the illustration hardly does the outfit justice. Nevertheless we suggest that anyone interested in the matter, and who has any doubt as to the practicability of the use of gas for hotel ranges, or for large hotel broilers, or for heating large quantities of water, should make a personal inspection of one of the Bailey Catering Company's kitchens on the exhibition grounds.

The Pan-American plan of kitchen work and equipment undoubtedly shows that gas is the best kitchen fuel. The cut shows the equipment in one of the 20 kitchens. At the left of the picture may be seen the hotel double broilers, each of which has six burners, giving a broiling surface of 24 inches square. To the center is shown the five-section, hotel range, made up specially for this contract, with very heavy steel, malleable iron drop-doors, the ovens being 22 inches wide, 26 inches deep and 13 inches high. Four top burners are above each oven, making 20 top burners in all.

The ranges are set on tile flooring. At the right of the ranges is shown the water heating apparatus, which consists for each kitchen of three, 50-gallon tanks. Each tank is equipped with 3 independent water heaters, connected in series. This apparatus furnishes water for the dish-washing machine, the water for which has to be kept at boiling point at all times. The outfit and its operation are well worth the close inspection of every visiting gas man.

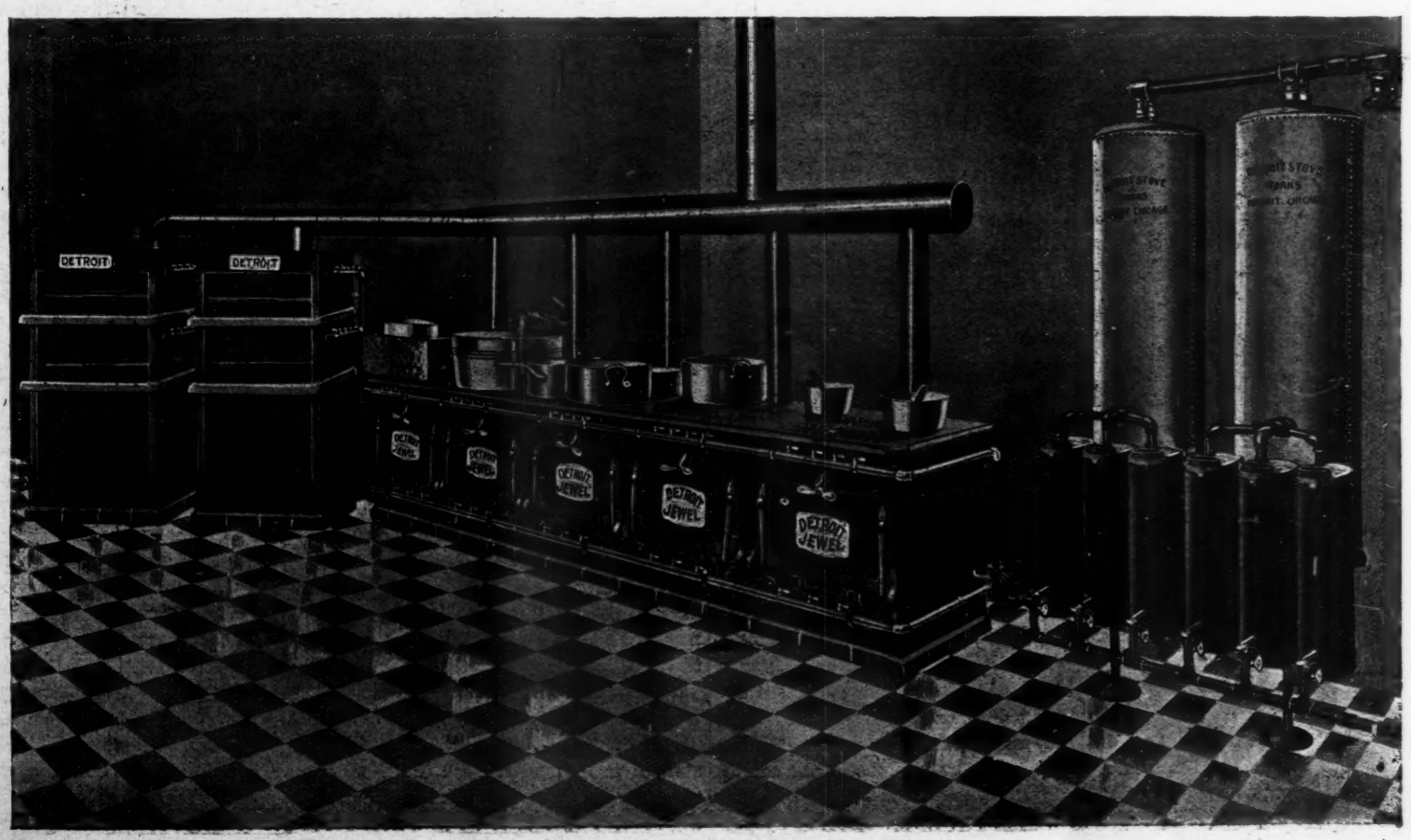
Schemes Worked in Western Oil Country.

By "G. D. R.," in *Am. Mfr.*

As is known in the commercial circles of this and other countries, a great amount of money has exchanged hands recently among dealers in oil well stocks, managers of oil wells, owners of lands on which oils have been found, prospectors and others.

In some cases fortunes have been lost and made. As the oil question continues to agitate various sections of the country, some information may be acceptable on the line of prospecting, ascertaining the worth of oils, stocks, conditions, safety of investments, and various problems that confront the oil world. Oil has been located in paying deposits in the earthy substance of the ground for many years but it has been but recently that the oil boom has caused hundreds and thousands of persons to pay out their money into wild cat schemes for pumping oil deposits from almost dry or salted wells.

In many of the Western cities and in some of the Eastern cities, one may find a large number of persons engaged in selling shares in oil concerns and many of these concerns are irresponsible because of the flimsy structure upon which they work. There are several points which ought to be considered in connection with oil investments and these



may best be brought out by investigating the factors relative to the business.

The man who invests extensively without a knowledge of prospecting for oils is taking chances. Some of the most successful men whom I met in California and Texas, which States I visited a few weeks ago with a view of looking into the oil interests, made their money from oil because they first carefully examined what they bought. I met with others who had lost fortunes through careless buying of stocks in wells which were claimed to be productive but were not. The investor in oil stocks need not be an expert in mining and engineering, but it will pay him to know that the conditions under which rock oil is found include a porous deposit of earthy matter in which the oils are stored, an impermeable bed of earthy substance for preventing the escape of the oil or gaseous matters, and finally an anticlinal arrangement of the strata. When these conditions prevail, the grade of oil which is found is usually of superior quality, and can be raised and utilized in the markets. Yet there are many cases reported of persons investing money in clay beds which contain a little greasy matter of no value.

Oils are found oozing from rock crevices and immediately the prospectors advertise the fact, and shares are sold at rich values. There are many places on the Pacific Slope where some good oils are obtained from the matter oozing from the rocks, but not in the quantity, as a rule, that would justify working the deposits. In sections of the country there are petroleum oils found in series of beds of sands ; these sands are usually in a semi-fluid state and contain salt water besides the oil, also often carburetted gases. In other portions of the country we find wells in successful operation, some of which are of the gusher description while others require the use of mechanical devices for elevating the oils. Often the petroleum exists in beds of soft clay or sandstone, sometimes in stratas 100 feet thick. I have seen sandstone soaked freely in oil and arrangements can be made for the oil to work its way down grade to the bottom of wells sunk in the vicinity. The oil can then be pumped from the wells. Sometimes the oil-bearing stratas are prevented from giving forth the oil-bearing deposits by thick beds of hard clay. There are without doubt many rich oil deposits in the country which are not known at the present because of the clay which exists above. Often this clay is broken through by chance by some one cutting a well to get water and then the oil is discovered. Usually it is the person who fails to realize the worth of the deposits who makes a discovery of this sort and when he finds his well greasy, he merely leaves it and tries another place for his well for water. If the well digger is familiar with the richness of oil-bearing properties, however, he quickly observes what he has discovered and by careful management can sell his property at greatly advanced prices to the oil men, who, in turn will split it up and sell it out to other prospectors who will honey-comb the land for oils.

There are several processes of boring wells for oils in use and it would not be amiss for the oil prospector or oil well buyer to be familiar with these. First, we have the rotation method which is used quite extensively. Secondly the process of percussion with ropes, and thirdly the process of percussion with rods. The first process involves the use of an auger for boring into and through soft shale, clay, sandy deposits and generally soft stuffs found in the formation of the earth. The auger is very like the carpenters' tool and is from 6 to 10 inches in diameter. The tool is easily turned by means of a cross-head at the opening and is sunk into the hole as fast as the latter is bored by means of lengthening rods. These rods are usually 1-inch gas pipes with connections. The boring is done by two men at the capstan and as fast as some of the earth is loosened, it is removed by the sand pump, by the letting down of scoops or by using a thread like contrivance for working up the residue. About 20 to 30 feet per day can be bored in this way and a depth of 400 or 500 feet is the average reached.

The second process which involves the boring of oil wells by percussion with rope is used in connection with the ordinary oil well rig which is now so frequently seen in the newly discovered oil fields of America. I saw many of this type in service in Texas. First the derrick is erected and often this work is done by the local carpenters, although there are Eastern concerns that make a business of furnishing derricks with complete rigs. Then a steam engine is needed, a band wheel, walking beam, and a sand pump. The engine operates the walking beam to the end of which is attached the device for working the drill.

The action of the drill consists in a constant lifting and falling motion, developed by the walking beam, and at each plunge. the bit is turned slightly, so that the action is the same as a stone cutter drilling a hole with a chisel and hammer. As fast as the bit loosens the earthy substance the particles are pumped up by means of a sand pump. This type of device can be used in rock as well as soft earth. Boring by percussion with rods calls for the service of connecting rods instead of ropes as in the previous mode. The rods can be wood or iron. The machinery consists of a machine for driving the rods and the cutting tool. The cutting tool is almost a plain chisel ranging from 10 to 30 inches wide with a straight edge for soft rock and a bevelled edge for hard rock. Sometimes there are 2, 4, or 6 blades to the chisel. The boring rods are jointed so as to permit lowering to great depths. Two men work the driving machine which is a windlass for lifting and depressing the rods. It is a simple affair. One man operates the raising and lowering contrivance and the other turns the rod a little at each blow. These are mostly for wells about 100 feet deep. Scoops are used to remove the loosened rock or other material at the bottom of tbe hole.

All buyers of stocks in oil well schemes should try to see the machinery employed at the works. I visited some of the Western oil properties which are liberally advertised through circulars in the East as being well equipped with modern apparatus and found that in many instances there were only one or two imperfectly erected, home-made oil rigs in service that gave very poor results. It is wiser to avoid these concerns. Concerns that advertise in the reliable newspapers or trade periodicals are more likely to be responsible, because the respectable newspaper will not print the advertisements of the wild cat oil concerns of the West. Your correspondent visited a number of newly established oil working plants in California, Texas and other places during the past few months and found great preparations for the developing of oil lands and the placing of new machinery. In some instances I saw that there were first-class mechanical and steam engineers on the premises who were preparing to put in proper steam power machinery, oil well working devices, and all the needed apparatus for working the oil discoveries in a correct way. In other instances the entire scheme appeared to me to be for purposes of deceiving, for the worst forms of worn out and second hand machinery were procured and set up and operated by Chinese coolie labor at wells which were producing nothing, so to speak, but which were salted for the purpose of producing oil while would-be buyers of stock were present. You can usually tell the transient oil well scheme for everything is erected with a view of quick shifts to other localities.

Although some of the wells and oil lands which I visited were producing excellently, I found upon careful investigation that it would be years before the lands would prove useful or profitable owing to the lack of transportation for getting the products to a market. I can name 25 or more concerns that have very good wells of great richness that cannot have any permauent success because it costs more to transport the oil to the sea coast or to a railway line than they can get for the oil. Yet the owners are keeping things going and selling stock freely, without telling anyone about the serious defect of transportation. The samples of oil assay right, the photographs of the works show the machinery to be modern and in good working condition, and nothing is said about the distance the oil must be hauled in carts to the nearest railroad line.

In my travels through the oil districts of California and Texas I noted several ways of salting oil wells. The commonest mode consists in tricking a farmer into finding oil and he will do the rest for you. Every farmer and in fact all land owners and it seemed to me everyone else was oil-mad in California when I was there. So it did not require much information about oil finds to start the thing going.

I will refer to one case. A party bought lands in a certain portion of the State and spent the next week or two telling the farmers of the vicinity of stories in which farmers he knew had discovered oil when digging wells for securing water for house or stock use. In a week or two this party had several farmers digging wells on their lands. He waited until three of the wells were of proper depth and one dark night had 2 or 3 barrels of oil dumped into each. The news of oil discoveries by the farmers spread quickly and 3 farmers received excellent offers for their lands, and 2 of the farmers, I am told, sold out at good prices. Then the party in question came forth and proclaimed the value of his lands for oil prospecting, and hundreds who had come with their money to trade with the farmers, invested with the fraudulent agent who reaped a rich harvest and then departed.

There are many cases on record of pouring oil into the heads of mountain streams and having the waters at its base assayed, and when the rich oil deposits are found, the properties are sold at advanced values to the unsuspecting. I have seen oil oozing from rock crevices which had been placed there by pouring the oil on the upper crusts and permitting it to soak through. The samples of oil-permeated rock substances are then assayed and, of course, are found to contain oil. Gushers are often produced and caused to operate for hours by depositing several barrels of oil in a hole bored 100 or more feet in the ground

and lowering in a nitroglycerine composition which is used in the Navy and which some of the oil well sellers have secured. The composition produces series of explosions which cause the oil to gush forth for hours.

One can have no idea to what extent the oil stock buying fever has gained a foothold throughout the country. All through the West and middle States everyone seemed to me to be talking oil. About every other person I met with had something to say about this or that oil stock in which he or she was interested. Occasionally I met with a person who had invested wisely or fortunately and had made money. Usually the story ran the other way, for there are many losers in the great game of oil in the West, but even this does not discourage extensive buying without careful examination of conditions. People are purchasing recklessly and the losses are often severe, but complaints are few. I visited a great many plants which were producing oil in fair quantities, but to tell the truth saw but very few concerns in operation that appeared to me to be safe for investment.

Miscellaneous Notes of Interest to Electric Central Station Men.—No. III.[1]

By Mr. W. H. Wakeman, in *Electricity*.

If a flange union is leaking steam and there is good reason for believing that the packing is not held as tightly as it might be, it is very natural for an engineer to seize a wrench and try to tighten up some of the nuts, without waiting to shut off the pressure. This is a dangerous practice, for as soon as one nut is screwed down more than the others, that bolt is subjected to more than its share of the stress, and sometimes it will give way under the abuse, the consequence of which is that the others are in turn caused to carry more of a load than they were intended for, and there is danger of the entire joint failing. Some of our plants are run for so many hours per day that it is difficult to find time to shut off steam and make repairs, but it is better to let the packing blow out of a joint than to run the risk of taking human life by screwing nuts up under a heavy pressure.

The cast iron doors in the rear wall of a tubular boiler setting are usually made so that a slight pressure from the inside will blow them open. The object in making them so is to allow a kind of safety valve action when the hot gases burn so fast that they explode (to use a common term), and it is a good idea to have such a vent, because without it some of the setting would surely be damaged sooner or later. Where the rear doors do not open easily, the furnace doors are sometimes thrown open quickly, and this is neither safe nor pleasant for the fireman. It is a bother to shut these doors occasionally, or to be unable to make steam when they are open, and not know what the matter is, still it is not a good plan to fasten them so that they cannot open easily.

When engineers are being examined for admission into engineering societies, they are sometimes asked the following question: "What are the first duties of an engineer, on taking charge of a steam plant that he is not familiar with?" The reply usually is that he should become thoroughly acquainted with the engines, boilers, pumps, etc., as soon as possible. This is proper, but I sometimes think that it would be well to study the peculiarities of the owner, or the superintendent, in order to know how to manage the "boss" as well as to manage the machinery that he owns. More than one good engineer has failed to hold his position because he neglected to do this, and others should profit by their example.

It is necessary for an engineer to feel of the crank pin of his engine while in motion, so as to know whether it is heating or not, and there is some danger of getting hurt while so doing; but if it is done right this danger will be reduced to a minimum. I have seen an engineer stand opposite the end of the crank shaft and catch the pin as it was at the highest point of its travel, but it appears to be about the worst plan that can be adopted. It is much better to stand just beyond the farthest point it reaches and hold the hand so that the pin will pass across it, for there is little danger in such a course, even with a high speed engine, This refers to the side crank type, but it may be applied to the center crank kind by letting the strap wipe across the hand instead of the head of the pin.

Every engine should be fitted with a sight feed lubricator, so as to put cylinder oil in drop by drop, but it should also be furnished with a small hand pump, so that if a glass breaks, or the lubricator fails to work from any other cause, it will not be necessary to shut down the engine for lack of oil. The art of making lubricators has reached a degree of perfection which makes them almost positive in operation, and there is little danger of their being broken, but it is the unexpected which sometimes happens, and when the engine has been shut down for a few minutes the cost of lost time will equal the cost of a pump, and in such a case the money goes without providing the pump. If it is secured in advance, when the lubricator is disabled there will be no interruption of the service and the prevention will prove much better than a cure.

When three or four heavy belts lead off from a shaft in one direction, it brings a strong pull on the bearing, which will create excessive friction and wear out the boxes rapidly. The careful engineer or millwright will avoid this as much as possible by having the belts lead off in opposite directions, so that the weight of one belt will offset that of another, and thus relieve the bearings of much stress. It is not always convenient to do this, and while trying to overcome the difficulty an engineer invented the idea of locating a crescent-shaped magnet as near to a pulley as possible, so that its attraction would counteract the pull of the belt. If it could be arranged so that one would just offset the other, it might work well, but I have never heard of its being accomplished.

I wish to suggest that whenever a steam user contemplates buying a new and untried kind of boiler, he should pay particular attention to the means provided for keeping it clean. A boiler may be safe under a high steam pressure, and it may be capable of developing much more power than its rating calls for, but if it cannot be easily cleaned it will not prove successful, for although it may show very good results when new, which means when it is clean, it will soon become coated with scale, and therefore will not be economical in the use of fuel. Dealers in boiler compounds may exaggerate the bad effects of scale in steam boilers, but after making all due allowance for their enthusiasm, there is still proof that an accumulation of foreign matter here is both costly and dangerous.

Occasionally an engineer may be found who tries to save expense when putting a small auxiliary engine into his plant, by using a smaller steam pipe than the cylinder calls for; also by making the exhaust pipe one or two sizes less than the engine builder intended. This plan may be satisfactory so long as the engine is not worked up to its full capacity; but when a full load is put on it, the initial pressure will be much less than boiler pressure, and it will grow less as the piston advances, because the small pipe cannot deliver steam enough to maintain it. The small exhaust pipe may be sufficient to conduct the steam away without causing much back pressure, but this cannot be known until the indicator is applied. The result of this is that the engine labors, the machine that it runs is not kept up to speed, and the whole arrangement is unsatisfactory.

1. *Ante*, p. 169.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A correspondent writes that Mr. John F. Wilcox, formerly in charge of the plant at Everett, Mass., of the United Coke and Gas Company, has connected himself with the Retort Coke Oven Company, the headquarters of which are located in the New England Building, Cleveland, O. From our correspondent's description this would imply that Mr. Wilcox has connected himself with a coal gas company.

Mr. John Connelly has been appointed to succeed Mr. W. H. Taylor as Superintendent of the Paris (Ky.) Gas Company. Mr. Taylor resigned the named position because the proprietors of the Company would not expend a sum equal to putting the works in some sort of fair shape for the demands that are sure to be made on it this winter. The "municipality of Paris" owns one-third of the stock of the Company.

At a special meeting of the Directors of the Charlestown (Mass.) Gas and Electric Company, held to take appropriate action respecting the death of Mr. George B. Neal, the record shows the following:

"In response to a vote at a special meeting of the Directors, President Hunnewell offered the following tribute to the late George B. Neal:

"Full of years and of good works, still in confident health, and amid the activity of a busy life, suddenly died George Benjamin Neal:

"For nearly half a century—it would have been completed next year—he filled the offices of Clerk and Treasurer and had the management of the Company, from its beginning on a small scale, in days of small things, until its size and business had increased ten-fold.

"When aged 29 he was a lawyer, starting his career in the office of the Hon. G. Washington Warren, the first President of the Company, and first Mayor of Charlestown. Mr. Warren asked him to take charge of the Company, which began active business in 1852.

"It was a new business here as in many other places then; and Mr. Neal, like his neighbor, Mr. Greenough, in the larger Gas Company of Boston, had a new profession to learn. Like his neighbor he learned it, and learned it well. Not only did he do so, but also, like Mr. Greenough he, for a long while, had the chief management of the Company with which he was connected.

"Through all the years he was in office he served the Company with devotion and to the best of his powers—and some of these were phenomenal.

"His activity, intelligence and long experience made him widely and well known. He became a veteran and an expert in his profession. His service here was remarkable, not only for duration, but also for integrity and conscientious performance of duty. Having an active nature, he delighted in its varied and constant exercise.

"He was President of the Mutual Protective Fire Insurance Company, senior Vice-President of the Five Cents' Savings Bank, and Director in the Monument Bank, all with offices on the same floor as those of the Gas Company. Further off he was a Director of the Somerville Electric Company and of the Lynn Gas Company, and was a member or officer of the New England Association of Gas Engineers, and of the Guild of Gas Managers. Also, he was a Director of the Bunker Hill Monument Association, Treasurer of the Ancient Charlestown Poor's Fund, and an officer in many religious and benevolent organizations.

"As a churchman he was at least equally active. For more than half a century he was an officer in St. John's Church—warden, treasurer, and, adding unusually an accomplishment that gave him much pleasure, he was also at times its organist.

"This large number of positions made him known to a far greater number and variety of persons than fairly falls to the average man. His kindness of heart—one of his marked characteristics—made him widely esteemed. Of the regard in which he was held by everyone employed by this Company there has been more than one strong and touching evidence.

"Notwithstanding his age—still in exceptional health at 78, though changes had been coming on him—he met, abruptly, physical break. In the midst of his many occupations and friendships he calmly passed away.

"One of the last of the old residents of Charlestown, identified with its institutions in great and good work for them, he was laid in his last earthly resting place by such a concourse as can there attend few men of his age. Many persons, one by one, dropped a rose upon him, and every hand that dropped a rose was actuated by the impulse of affection.

"Along with the roses, let us add the old Latin words, so often placed over a good man departed, '*Requiescat in pace, Domini!*' he rests in the peace of the Lord.

"*Voted*, That this tribute to Mr. Neal be entered on the records of this Company; that a copy be sent, by the Clerk *pro tempore*, to his daughter; and that another copy be sent to the Charlestown *Enterprise* for publication."

THE following letter explains itself:

ENGINEER'S OFFICE, INDIANAPOLIS GAS COMPANY,
INDIANAPOLIS, IND. August 5, 1901.

To the Editors AMERICAN GAS LIGHT JOURNAL: In Mr. John A. Britton's excellent address, published in your issue of the 29th ult., I find the following statement. In disposing of the leakage question Mr. Britton says: "It is a twin brother of that other spectre, electrolysis, which has finally been captured and subdued." As electrolysis is still with us, and, I am sure, with a large number of your readers, a very pressing and tangible evil, we would be much gratified to learn from Mr. Britton how, where and when it has been captured and subdued? —Yours very truly, JAS. SOMERVILLE.

MR. EDGER TREGONING, Manager of the Attleboro (Mass.) Steam and Electric Company, writing to Messrs. Adam Weber Sons, of this city, under date of the 30th ult., said: "It gives us much pleasure to say a few words of praise regarding the radial brick chimney you have erected for us at our power station. After a careful research on the chimney question we decided to place the contract with you, and we must say we are very much pleased with the way the work was performed and the rapidity with which the work progressed. The construction is A1 throughout, and we congratulate you on your style of chimney construction. We write this to show you our appreciation, and wish you success."

MR. H. E. CHUBBUCK, Secretary of the Illinois State Electric Association, informs us that the next annual meeting of the Association will be held in Rock Island, Ills., the 24th and 25th of September, instead of the 25th of November, as originally planned. The headquarters of the Association will be in the Harper House, and an excellent technical and social programme has been arranged. Secretary Chubbuck, as most of our readers know, is the efficient General Manager of the Quincy (Ills.) Gas and Electric Company.

MR. J. B. BOYD, Secretary of the San Diego (Cal.) Gas Company, informs the shareholders that at a meeting of the Company, held at its offices the morning of July 30th, it was determined to make a radical change in the policy of the Company. Full particulars of the new departure will soon be ready for publication.

AT the annual meeting of the Northampton (Mass.) Gas Light Company the following officers were elected: Directors, John F. Starr, Clark Seelye, C. N. Clark, G. H. Banister, and H. C. Crafts. President, C. N. Clark; Clerk and Treasurer, E. H. Banister; Superintendent, H. C. Crafts; Assistant Treasurer and Bookkeeper, R. M. Starkweather.

WE understand that the gas and electric lighting plants of the Tiffin (O.) Gas Light Company and the properties of the Tiffin Light and Fuel Company have been purchased by a syndicate operating under the title of the Consolidated Gas and Light Company.

IT is said that a gas works is to be constructed at Washington, N. J. It is also said that Mr. B. Van Steenberg is the prime mover in thea ffair.

ANOTHER gas project is that which calls for the placing of a plant in Paulsboro, N. J.

THE executive management of the Columbus (O.) Gas Company, following the recent meeting of the shareholders, may thus be reported: President, George W. Sinks; Secretary and Treasurer, E. E. Eysenbach; General Manager, J. L. Johnston.

THE United Gas and Oil Company, of Windsor, Ont., beginning September 1st, will charge 30 cents per 1,000 cubic feet, net, for a supply of natural gas.

MR. CLARENCE M. SMITH has been appointed Superintendent of the gas and electric light division of the of the Oroville (Cal.) Water Company.

THE plant of the Santa Rosa (Cal.) Merchants Lighting Company has been purchased by the California Central Gas and Electric Company.

THE Pacific Meter Company, to deal in articles used in the manufacture or use of gas, with its principal place of business in San Francisco, Cal., has been incorporated by Messrs. F. J. Symmes and V. Stow, of San Francisco; W. M. DuVal and W. Olney, Jr., of Oakland, Cal.; and Wm. McDonald, of Albany, N. Y. The capitalization of the Company is $50,000.

THE Winona (Minn.) Gas Company, which is the medium for the reorganizing of the Winona Gas Light Company, has been incorporated. The proprietors hitherto in interest remain in control.

THE new plant of the Wichita (Kas.) Gas Company will be completed November 1st. The generating house is to be constructed on the latest improved plans of Mr. Frederick Bredel.

THE Capital City Gas Company, of Des Moines, Ia., has paid into the city treasury the sum of $1,881.72, which sum represents 2 per cent. on the Company's gross sales for the 6 months ended June 30th last.

THE consolidation of the Mobile (Ala.) Gas Light Company with the Mobile Light and Railroad Company, will be formally made the 1st prox.

THE Hartford City (Conn.) Gas Light Company's works will have been greatly benefited when the railroad spur direct into its yards now underway is finished.

MR. D. DECKER has been appointed Superintendent of the works of the Chico (Cal.) Gas and Electric Company.

A REDUCTION of 5 cents per 1,000 in the selling rate for gas has been ordered by the proprietors of the New Bedford (Mass.) Gas and Edison Light Company. The charge for electric currents has been reduced from 20 cents to 18 cents per kilowatt hour, with a discount of from 10 to 20 per cent. for prompt payment, according to quantities used.

THE project for the supply of gas in Naugatuck, Conn., is sure to materialize, the authorities having granted the necessary privileges on such account to the Connecticut Railway and Lighting Company.

THE New York and Richmond Gas Light Company has moved its office to the new Pape building, Stapleton, Staten Island.

MR. PHILIP J. O'CONNELL, Mayor of Worcester, Mass., has presented the following petition to the Board of Gas and Electric Light Commissioners:

"Now comes Philip J. O'Connell, in his capacity of Mayor of the city of Worcester, within said Commonwealth, acting upon his own judgment and being further authorized hereto by order of the City Council of the said city of Worcester, and complains of the price of electric lights sold and delivered in said city of Worcester, and to said city of Worcester, by the Worcester Electric Light Company, the corporation authorized to sell electric lights in said city, and says that the price heretofore charged to said city of Worcester, under a contract of 3 years, terminating on the 1st day of July, 1901, was 32 cents per night of 10½ hours on the average per light of 2,000-candle power, and that the demand of said Worcester Electric Light Company for furnishing said lights of 2,000-candle power per night under a contract of 5 years from the 1st day of July, 1901, was for such lights per night for the 1st year 31 cents, for the 2d year 30¾ cents, for the 3d year 30½ cents, for the 4th year 30¼ cents, and for the 5th year 30 cents, averaging for the 5 years 30 $\frac{5}{16}$ cents per such light per night, and avers that the prices so as aforesaid and otherwise charged and demanded by said Worcester Electric Light Company are excessive and more than ought reasonably to be charged.

"Wherefore, he prays for an inquiry into the subject matter of the prices charged and demanded by said Company for electric lights; and prays that your honorable board will order a reduction in the price so charged and demanded, and for such further orders, decrees and actions in the premises as may be necessary, and as may to law and justice appertain."

The Market for Gas Securities.

The trading in city gas shares during the week was peculiar, in that on comparatively small trading Consolidated made a gain of about 2 points over the quotation of a week ago, in spite of the fact that the general market was showing decided symptoms of heaviness. Of course, no one outside the trinity of owners can tell what "agreements" are ready for promulgation, but the satellites or acolytes will not forego the idea that there will shortly be news of moment respecting the thought-of Brooklyn Union deal. Being not in the trinity, nor of the satellites, our own belief is that local gas shares will go lower before they go appreciably higher.

The nominal quotation for Mutual is 300 to 315. That Company's position is a wonderfully strong one.

Brooklyn Union in sympathy with its neighbor went up a bit, but it is yet nowhere near its real value. A rather senseless break occurred this afternoon (Friday) in Peoples, of Chicago. Opening at 113½, ex-div., it sold down to 108⅝, closing at 108⅝ to 108¾. It is a cheap stock at the asking price, or at a price 10 points above.

Bay State is steady at 1, and to the man on the curb it looks that Mr. Addicks is closer to more important trouble than he ever had. Baltimore gas is unchanged.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

AUGUST 12.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	220	221
Central Union, Bonds, 5's.	3,000,000	1,000	109	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	305	315
" Bonds	1,300,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	108¾	109¼
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River				
Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000		108	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	135	..
Preferred	5,000,000	100	153	.
Bonds, 1st Mortgage, 5's	1,500,000	1,000	113	115
Yonkers	299,650	500	180	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	214	220
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	⅜	1
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works.	450,000	100	30	40
" 1st Mtg. 5's	509,000	1,000	92⅜	95
Boston United Gas Co.—				
1st Series S. F. Trust.	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6½	7½
" " Bonds, 5's	5,250,000	1,000	73	76
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	103⅛	103¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	215	216
Consolidated, Baltimore	11,000,000	100	64½	65
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	380,000	1,000	81½	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	31	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	54	58
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	66
" Bonds, 6's	2 650,000	..	98	..
Jackson Gas Co.	250,000	50	70	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	101½	103
Laclede, St. Louis	10,000,000	100	85	95
Preferred	2,500,000	100	99	101
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co.				
" 1st Mtg. 6's due 1910	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	183	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	113	113½x
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	46	46½
St. Paul Gas Light Co.	1,500,000	100	50	55
1st Mortgage 6's.	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's.	2,465,000	1,000	88	90¼
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	85	87
Syracuse, N. Y.	1,750,000	100	18	22
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	298	300
First mortgage 6's	600,000	..	..	..
Western, Milwaukee.				
Bonds, 5's	4,000,000	..	106	108
Wilmington, Del.	600,000	50	200	201

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Position Wanted.

A YOUNG MAN who has had several years' experience with gas stoves is open for an engagement as head of stove department, or manager of out-of-town company. Fully conversant with all branches of the gas business. References. Address, "MANAGER," 1366-1 Care this Journal.

Position Wanted

As Superintendent of Small Gas Works

(Coal gas preferred), by a man who has had over 20 years' experience in gas works Satisfactory reasons given for leaving present position, and testimonials, if required.

1366-1 Address, "A. Z.," care this Journal.

Position Wanted

An energetic, capable man desires position as **Superintendent of a Small Gas Works.** Has had several years' experience in such capacity, and is able to take complete charge of the manufacturing and distributing divisions. Can furnish satisfactory references.

1365-2 Address, "C. H. W.," care this Journal.

PIPE FITTER WANTED.

AN EXPERIENCED MAN, to run services, pipe houses, set meters, stoves, etc., for a small gas works. One preferred having knowledge of gas manufacture. Permanent situation.

Address, stating age and wages expected,

1366-1 "C. G. C.," care this Journal.

FOREMAN WANTED.

A WORKS putting out 500,000 cubic feet per day wishes to hire a competent foreman. Must understand the working of regenerative benches. A good salary will be paid.

1360-tf Address, "COAL GAS," care this Journal.

FOR SALE, CHEAP.

Four Purifiers, 6 feet by 8 feet by 3 feet 6 inches, for 8-inch connections.
Ironwork, Complete, for four benches of 8's.
Mouthpieces and Lids for two benches of 6's.
One Air Condenser.
One Square Scrubber.
One Station Meter, 4 feet by 4 feet.
All in good condition.

Address, CUMBERLAND GAS LIGHT CO.,
1364-tf Cumberland, Md.

FOR SALE.

One Steel Multitubular Condenser, 42 inches diameter by 14 feet high.
One Steel Tower Scrubber, 42 inches diameter by 16 feet high, with spray and trays.
(The above have been in use only 1 year, and are as good as new.)
Hydraulic Main and Ironwork for four benches of 6's.
Will sell all or part of above. Address,

THE OSHKOSH GAS LIGHT COMPANY,
1363-4 Oshkosh, Wis.

FOR SALE.

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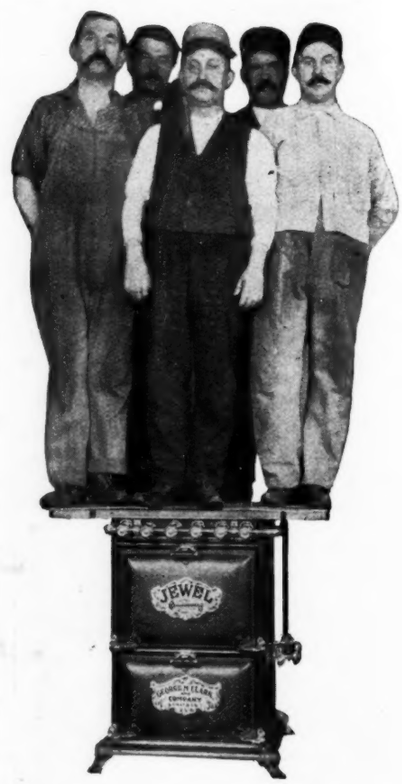

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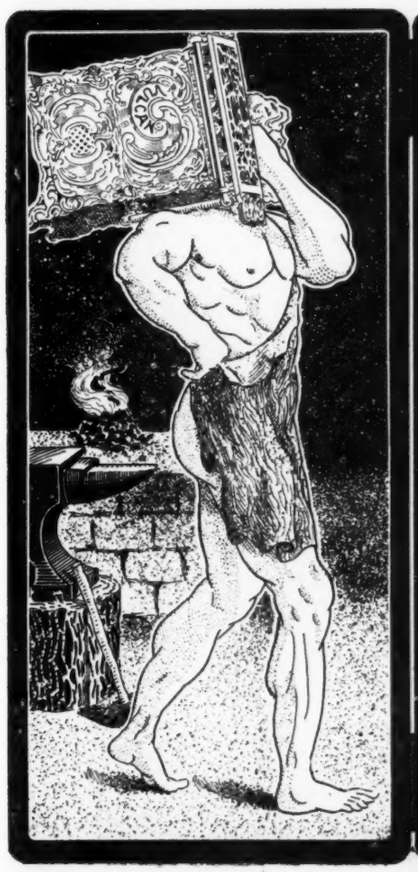

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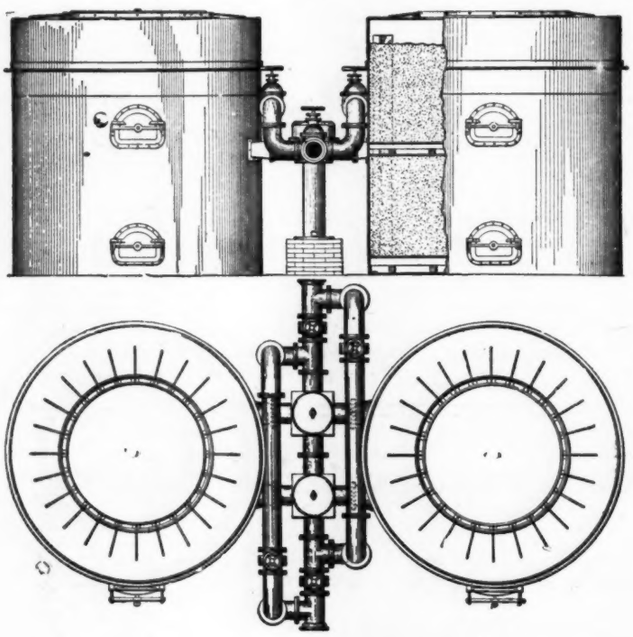

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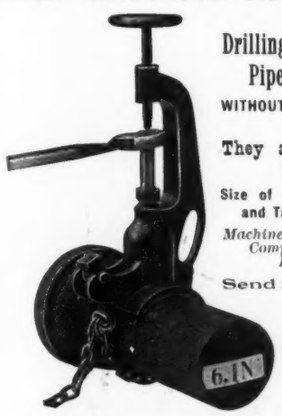

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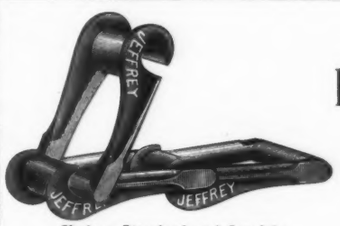

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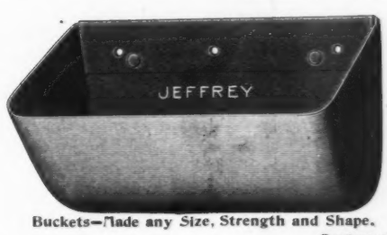

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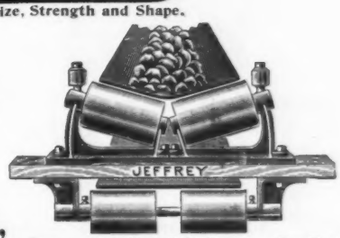

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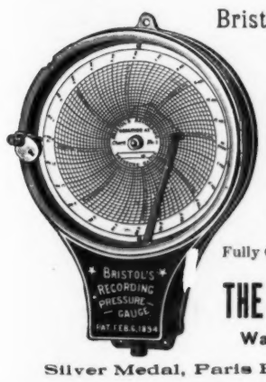

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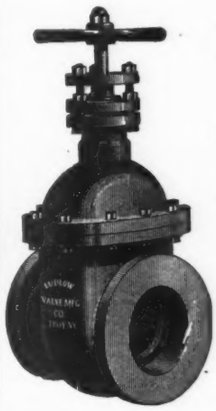

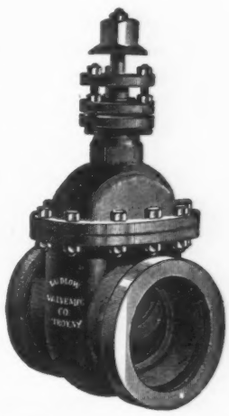

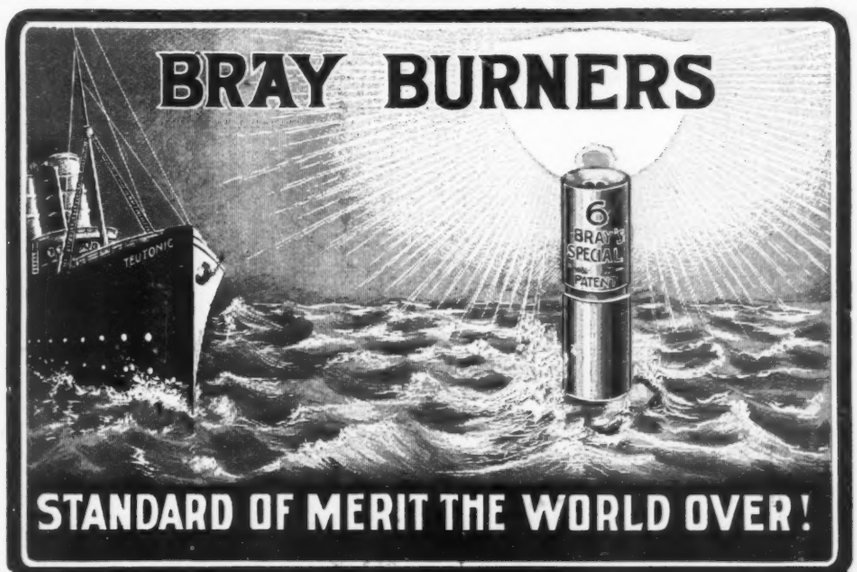

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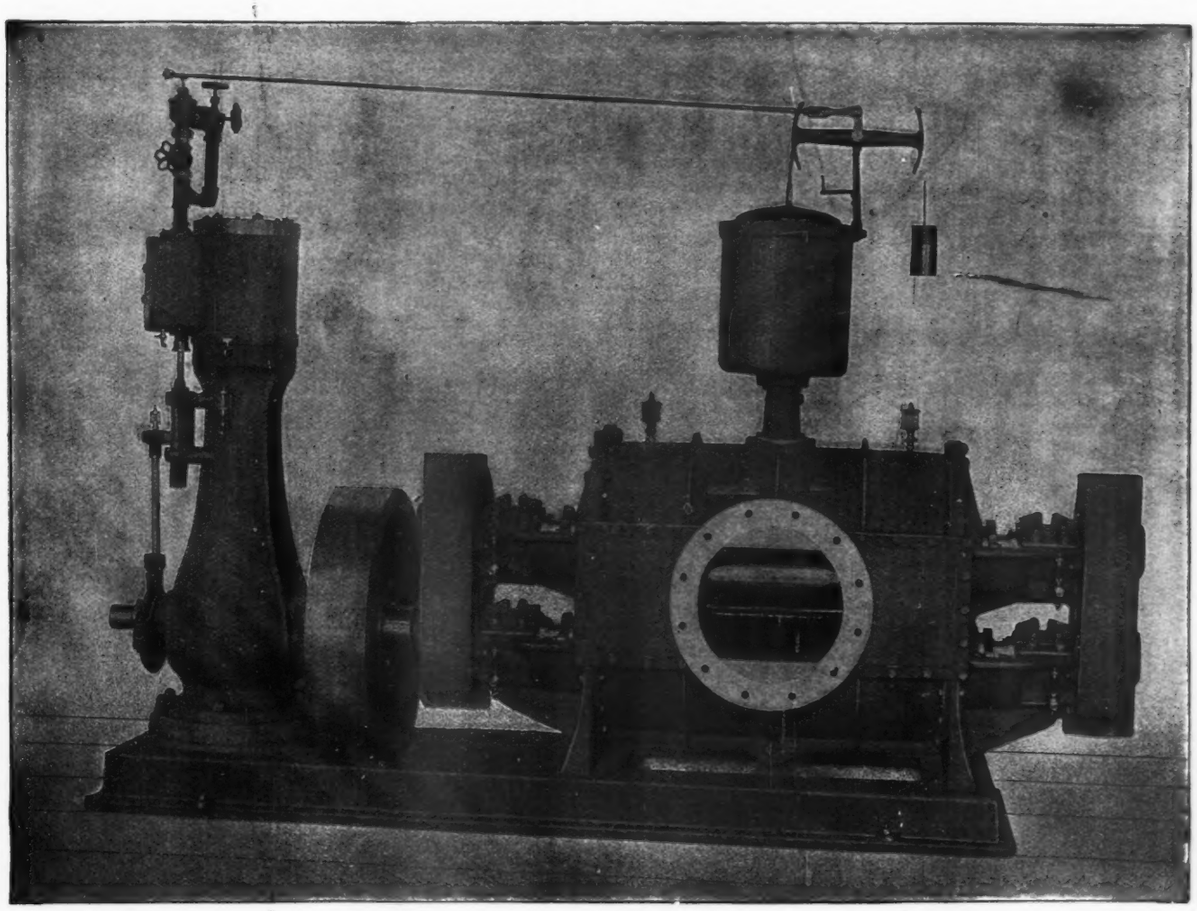

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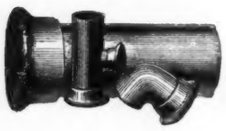

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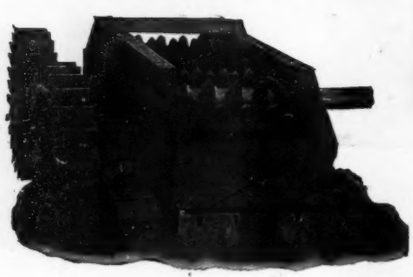

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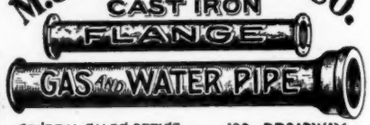

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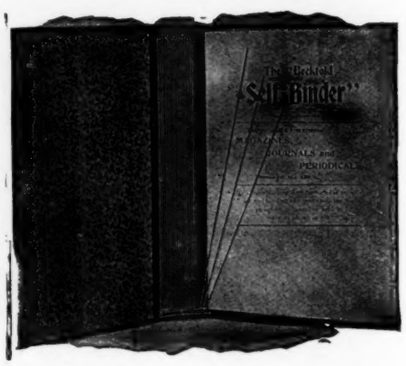

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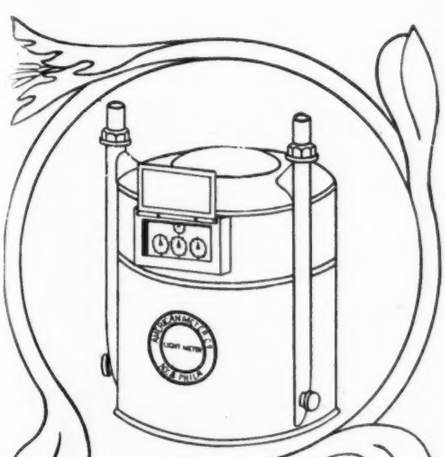

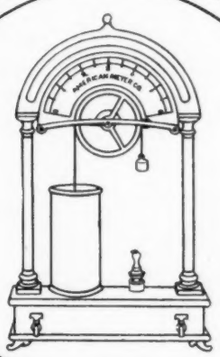

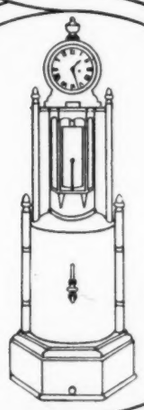

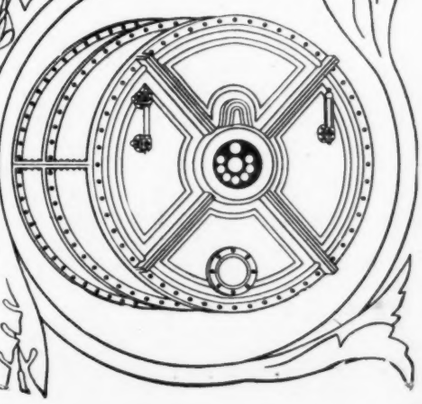

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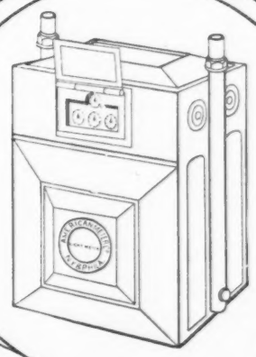
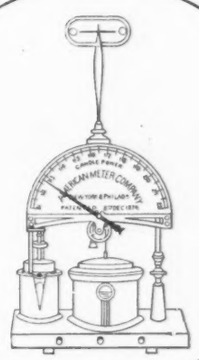
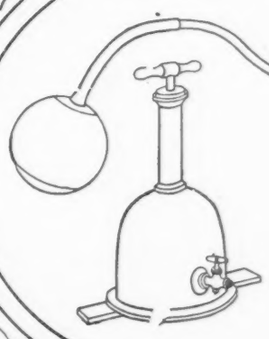
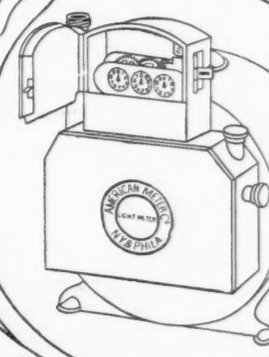








PUBLIC LIGHTING TABLE.

AUGUST, 1901.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Thu.	1	7.40 PM	8.40 PM	7.10	3.30
Fri.	2	7.40	9.20	7.10	3.30
Sat.	3	7.40	9.50	7.10	3.30
Sun.	4	7.40	10.20	7.10	3.30
Mon.	5	7.40	11.00	7.10	3.30
Tue.	6	7.40 LQ	11.40	7.10	3.45
Wed.	7	7.40	12.30 AM	7.10	3.45
Thu.	8	7.40	1.20	7.10	3.45
Fri.	9	7.40	2.10	7.10	3.45
Sat.	10	7.40	4.10	7.10	3.45
Sun.	11	7.30	4.10	7.10	3.45
Mon.	12	7.30	4.10	7.10	3.45
Tue.	13	7.30 NM	4.10	6.55	4.00
Wed.	14	7.30	4.10	6.55	4.00
Thu.	15	7.30	4.10	6.55	4.00
Fri.	16	7.30	4.10	6.55	4.00
Sat.	17	7.30	4.10	6.55	4.00
Sun.	18	7.50	4.20	6.55	4.00
Mon.	19	8.20	4.20	6.55	4.00
Tue.	20	8.50	4.20	6.45	4.10
Wed.	21	9.30 FQ	4.20	6.45	4.10
Thu.	22	10.10	4.20	6.45	4.10
Fri.	23	11.00	4.20	6.45	4.10
Sat.	24	11.50	4.20	6.45	4.10
Sun.	25	12.50 AM	4.20	6.45	4.10
Mon.	26	2.00	4.20	6.45	4.10
Tue.	27	3.00	4.20	6.30	4.20
Wed.	28	No L.	No L.	6.30	4.20
Thu.	29	No L. FM	No L.	6.30	4.20
Fri.	30	No L.	No L.	6.30	4.20
Sat.	31	7.00 PM	8.20 PM	6.30	4.20

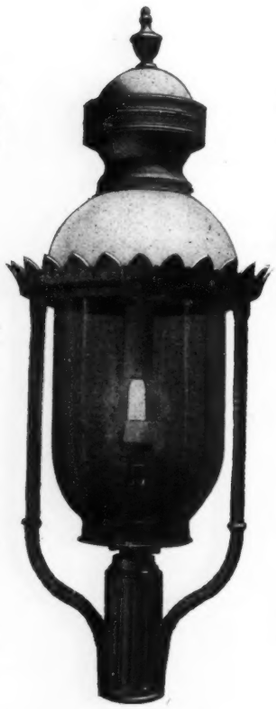
TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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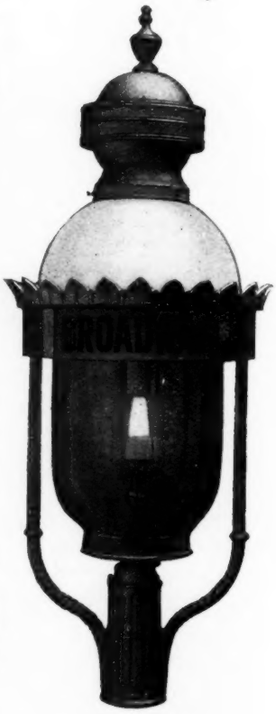

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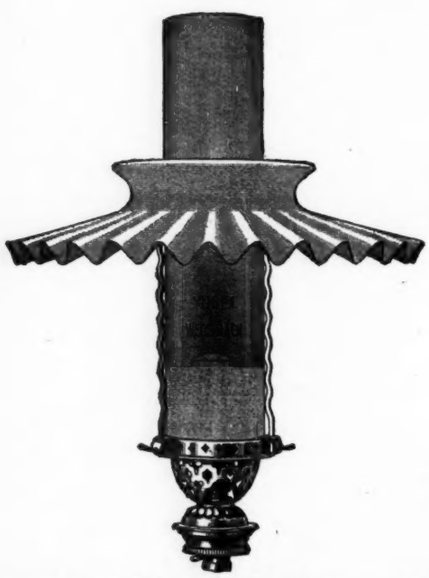

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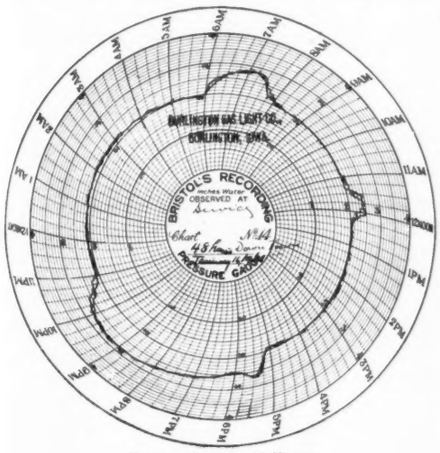

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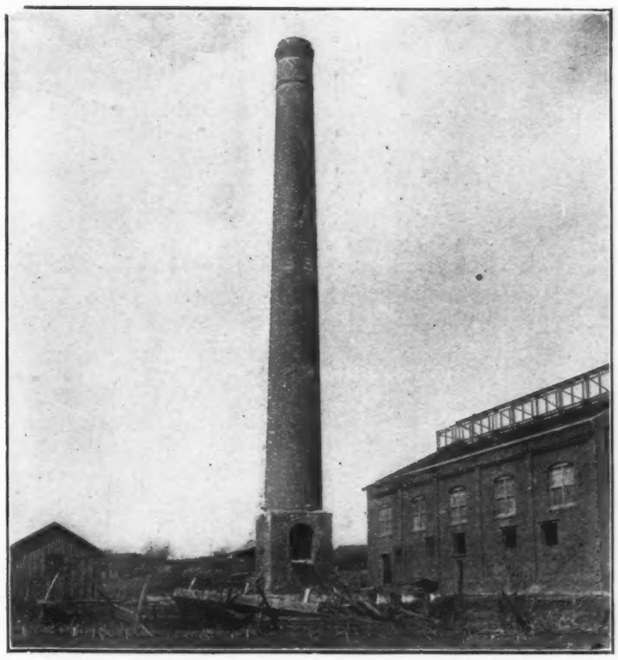

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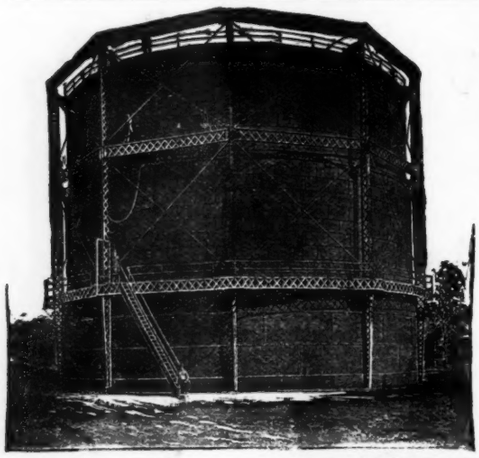

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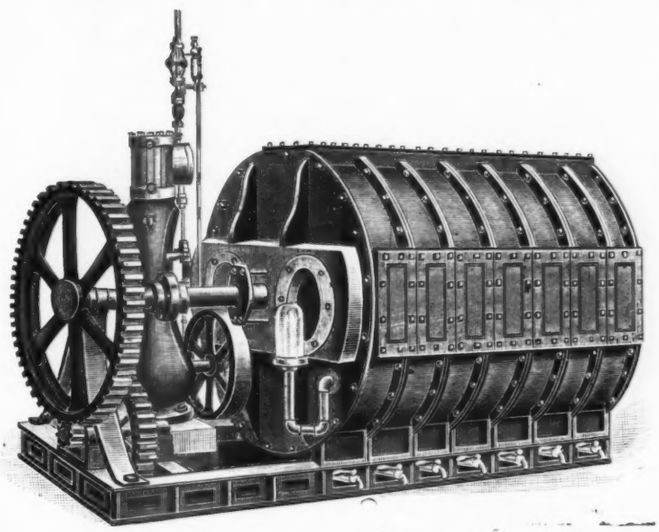

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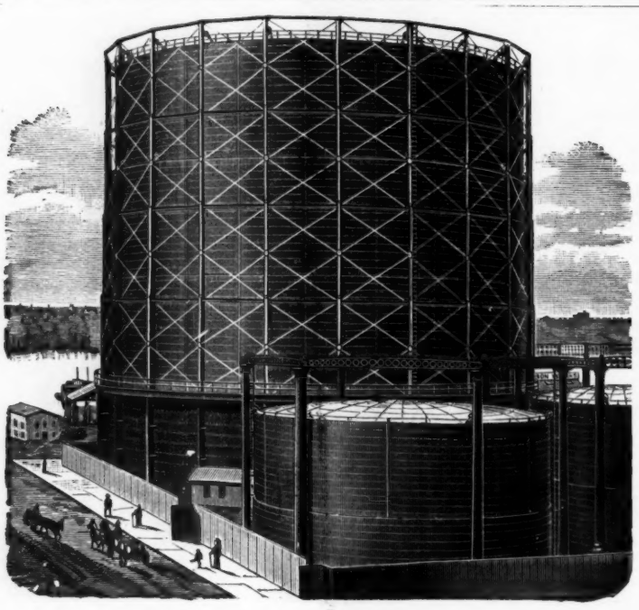

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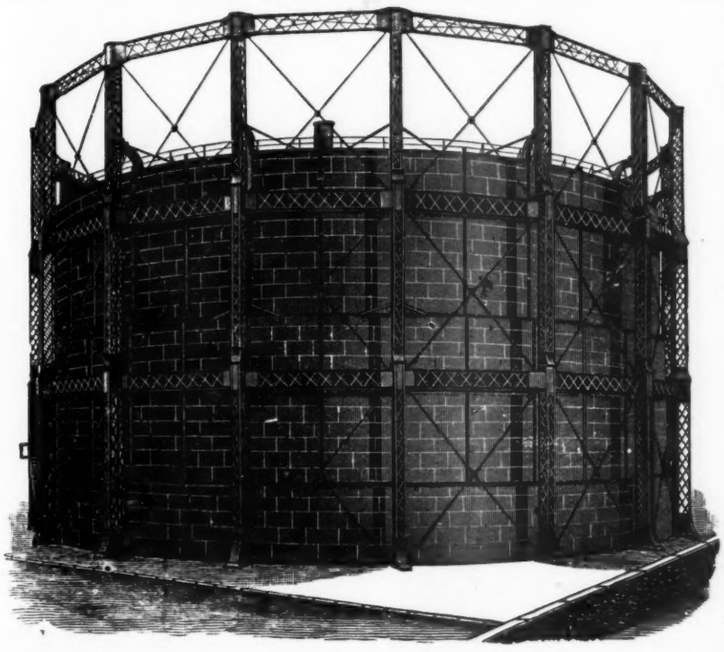

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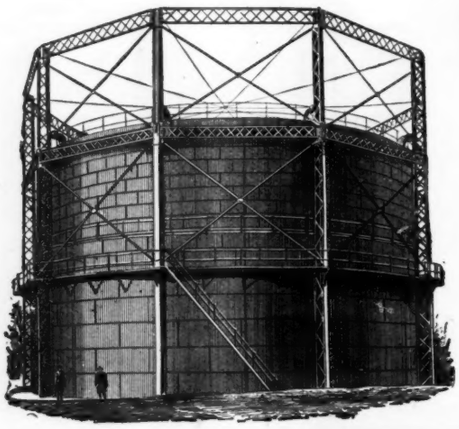

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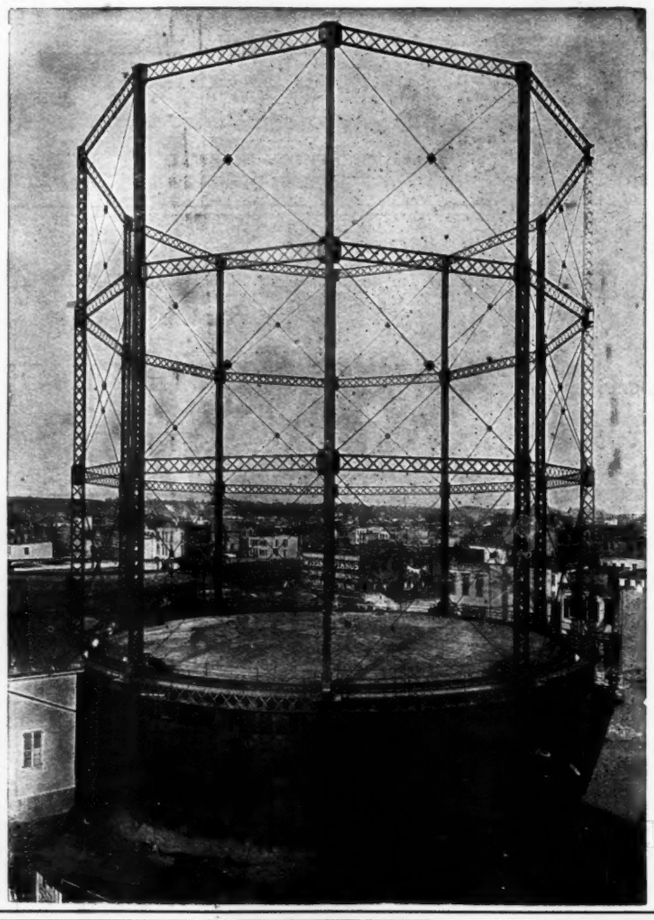

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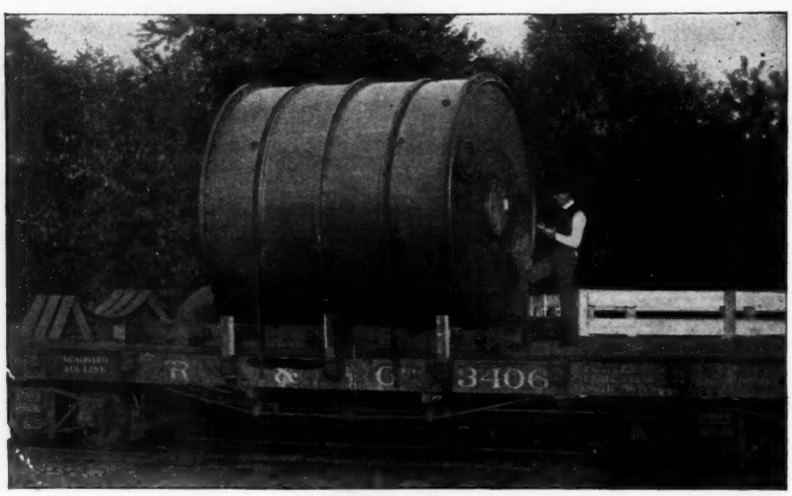

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